

## **TECHNICAL MANUAL MAINTENANCE INSTRUCTIONS**

**DEPOT**

**GEARBOX MODULE**

**AIRCRAFT ENGINE  
USAF MODEL  
F100-PW-229**

**PRATT & WHITNEY  
LARGE MILITARY ENGINES  
UNITED TECHNOLOGIES CORPORATION  
F33657-84-C-2014  
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**THIS PUBLICATION IS ONE OF A SET OF TWELVE MANUALS. THE COMPLETE SET CONSISTING OF T.O. 2J-F100-53-1 THROUGH T.O. 2J-F100-53-11 AND T.O. 2J-F100-11-2 IS REQUIRED FOR DEPOT MAINTENANCE.**

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**RECORD OF CHANGES**

Original . . . . .	15 Aug 91	Change 12 . . . . .	15 Aug 95
Change 1 . . . . .	15 Nov 91	Change 13 . . . . .	15 Nov 95
Change 2 . . . . .	15 Feb 92	Change 14 . . . . .	15 Feb 96
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Change 6 . . . . .	15 May 93	Change 18 . . . . .	15 Aug 97
Change 7 . . . . .	15 Nov 93	Change 19 . . . . .	15 Feb 98
Change 8 . . . . .	15 Feb 94	Change 20 . . . . .	15 Aug 98
Change 9 . . . . .	15 May 94	Change 21 . . . . .	15 Nov 98
Change 10 . . . . .	15 Nov 94	Change 22 . . . . .	15 Feb 99
Change 11 . . . . .	15 Feb 95	Change 23 . . . . .	15 Aug 99

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**NUMERICAL INDEX OF EFFECTIVE WORK PACKAGES****NOTE**

Only those work packages (WP) and subordinate work packages (SWP) assigned to this manual are listed in this index.

Insert Change No. 23 work packages and subordinate work packages, dated 15 August 1999. Dispose of superseded work packages and subordinate work packages. If changed pages are issued to a work package or subordinate work package, insert the changed pages in the applicable work package or subordinate work package.

The portion of the text affected in a changed or revised WP or SWP is indicated by change bars in the outer margin of each column of text. Changes to illustrations are indicated by pointing hands or change bars, as applicable. Changes to wiring diagrams are indicated by shaded areas.

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\*Zero in this Column Indicates an Original WP/SWP



## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229(V)-501	01 JAN 95	O/I	Incorporation of 30 micron oil filter with full-flow bypass valve, F100-PW-229 Engines, F-15/F-16 Aircraft (ECP 90QA168C1)
2J-F100229(V)-504	15 SEP 94	D	Installation of increased life power take off (PTO) duplex bearing P/N 4080062-01, F100-PW-229 Engines, F-15/F-16 Aircraft (ECP 92QA151)



## **SAFETY SUMMARY**

### **INTRODUCTION**

This Technical Order (T.O.) describes physical and chemical processes which may require the use of chemicals, solvents, paints, or other commercially available hazardous material. This T.O. also describes maintenance actions which may require handling or use of potentially dangerous parts or equipment.

Personnel performing maintenance procedures and practices included in this T.O. shall be familiar with safety precautions and procedures associated with chemicals and other hazardous materials, parts and equipment. The user of this T.O. shall consult their local safety and health staff and Material Safety Data Sheet (MSDS) concerning any questions on hazardous chemicals, personal protective equipment requirements, and appropriate handling and emergency procedures. The user shall become completely familiar with the manufacturer/supplier information and adhere to the procedures, recommendations, warnings, and cautions of the manufacturer/supplier for the safe use, handling, storage, and disposal of these materials. Disregarding safety precautions and procedures or performing unauthorized maintenance can cause engine or equipment damage, serious injury, illness, or death.

### **BACKUP WRENCH**

When torquing or breaking torque on any tube coupling nut, use a suitable wrench to apply torque to the fitting to which the part is attached. Failure to properly use a backup wrench can result in failure of tubes and accessories due to stress loading during torquing procedures.

### **BEARING HANDLING**

The most common cause of bearing damage is attributed to improper preservation and mishandling. Do not handle bearings with bare hands. Wear approved gloves when handling bearings. Coat bearings with engine oil and store in labeled containers as matched sets. Ensure all bearing components have matching serial numbers before installation to prevent bearing failure due to mismatched contact surfaces.

### **BRAZING, SOLDERING AND WELDING**

Brazing, soldering and welding operations may produce fumes that can be harmful to breathe. Arc welding emits ultraviolet light, which can burn the skin and eyes. Provide adequate ventilation. Wear protective clothing/equipment. Ensure gas bottles are properly secured.

### **CABLES, ELECTRICAL**

Small radius bends or severe flexing of electrical cables can result in damage to conductors and/or outer braid.

**SAFETY SUMMARY (continued)**

**CARBON SEALS AND SEAL SEATS**

Carbon seals and carbon seal seats are easily damaged and shall be handled with care. Do not allow carbon seals to come in contact with petroleum based solvents. These solvents will reduce the lubricity of the carbons and result in rapid seal wear. Do not handle carbon seals or seal seats with bare hands. Wear approved, lint free gloves.

**CHEMICAL COMPOUNDS AND SOLUTIONS**

Many of the chemical compounds and solutions used in cleaning, inspection, and repair may cause irritation to the skin, eyes, and respiratory system. Many of the chemicals, including their vapors, may be poisonous, easily ignited, corrosive, and react violently with incompatible materials. Improper mixing and combining of these chemicals may produce violent reactions, rapid heat generation, and explosive/toxic gases. Heating certain chemicals may cause toxic gases to be produced. Observe manufacturer's warning labels and Material Safety Data Sheet (MSDS) instructions for proper handling, storage, and disposal. Consult the local Safety Office for additional information.

**COMPRESSED AIR**

Compressed air can generate flying debris and can cause severe injury if air blast penetrates the skin or eyes. Reduce compressed air pressure for cleaning or drying to less than 30 psig. Use with effective chip guarding and personal protective equipment. Do not direct air blast toward other personnel.

**COMPRESSED GASES**

Many compressed gases are highly flammable/explosive and can cause suffocation at varied levels of concentration or exposure time. Some of the gases can freeze body tissue. Keep ignition sources away. Provide adequate ventilation. Wear protective clothing/equipment. Store in properly marked/labeled containers at approved locations. Do not use in confined areas which may create an explosive atmosphere. Refer to specific Material Safety Data Sheet (MSDS) for additional information.

**DANGEROUS PRESSURE**

Pressure system precautions apply to all equipment using gases and fluids at all ranges of pressure. To avoid injury, stand clear of tooling and parts being pressure tested when pressure is being applied. Proper tool installation, shielding and hose connections shall be ensured before applying pressure. Ensure all system components are compatible with pressures applied and pressure medium used. Pressure shall be applied slowly.

**SAFETY SUMMARY (continued)****ELECTROSTATIC DISCHARGE (ESD)**

Circuit card assemblies and their related components may be damaged by undetectable electrostatic discharge. Care shall be used during handling or repair of these items. Use electrostatic discharge precautionary standard operating procedures.

**ENGINE AND ACCESSORIES - TEMPERATURE**

Aircraft engines and accessories are extremely hot following operation. Allow sufficient time to cool or wear protective clothing/equipment when maintenance or inspection tasks are required following engine operation. Failure to comply may result in injury to personnel.

**ENGINE AND CONTROLS PRESERVATION**

Engines and engine controls shall be drained of all fuel and preserved before shipping. Failure to drain fuel can result in a fire hazard. Engine preservation replaces any fuel with oil, which acts as a corrosion preventing agent.

**FOREIGN OBJECT DAMAGE (FOD)**

Foreign objects can enter engine compartments and accessories during maintenance. Always be aware of the potential for foreign object damage (FOD) entering any uncovered opening of an engine or accessory. Always thoroughly clean parts and compartments to remove all foreign material. Make a final detail inspection of the work area when the job is finished. Follow standard operating procedures for tool and equipment accountability.

**FOOD AND TOBACCO**

Wash hands and face thoroughly prior to smoking tobacco products or eating food. Residue of the materials used in engine and equipment maintenance can cause serious health problems if ingested or inhaled in the smoke.

**HEARING PROTECTION**

The frequency and intensity of noise generated during some operations may cause an acute or chronic hearing impairment. Wear approved hearing protection equipment. Contact the local safety office or bioenvironmental engineering for further guidance.

## **SAFETY SUMMARY (continued)**

### **HYDRAULIC TOOLING**

Application of hydraulic pressure to tooling or engine parts can cause them to jump with enough force to cause personal injury. Excessive pressure applied to tooling by a hydraulic pump can cause a structural failure to the engine part and/or the tooling which could result in personal injury. Using a ram with a nonapproved part number or exceeding hydraulic pump pressure can result in excessive pressure being applied to tooling. Do not exceed ram capacity for a given tool. Stand clear of tooling and engine parts during hydraulic tool operations.

### **JEWELRY**

Remove rings, watches, necklaces, and other metallic objects that may be snagged or cause shock or burn hazards.

### **LEAD SEALS**

Lead seals shall only be removed when specifically called for in the procedure. Lead seals identify areas of critical adjustment that can only be attained at the Depot or Vendor level.

### **LIFTING, ROTATING, AND SUPPORTING**

Personnel shall stay clear of objects being lifted during hoist operations or when objects are supported by temporary transition supports. To prevent personal injury, use adequate number of personnel and appropriately rated lifting/handling devices to lift or move objects. Unless specified in the procedures, personnel shall not work on objects suspended by a hoist or supported by temporary transition supports. Personnel shall be prepared for potential unbalanced conditions during hoist operations.

### **LIVE ELECTRICAL CIRCUITS**

Do not work on electrical systems, replace components, or make adjustments to equipment with the electrical supply turned on. Under certain conditions, danger may exist even when the power control is in the ''off'' position due to charges retained by capacitors. To avoid injuries, always remove power from, discharge, and ground a circuit prior to servicing. Adhere to all lock-out/tag-out requirements.

### **MAINTENANCE STANDS AND FIXTURES**

Ensure modules or assemblies are firmly secured to work stands or fixtures before performing maintenance procedures. Personal injury or damage to modules or assemblies may occur if a work stand or fixture slips.

**SAFETY SUMMARY (continued)****METAL MACHINING PROCESSES**

Metal machining processes may generate dust, fumes, filings, and/or shavings which may cause acute/chronic irritation to the skin, eyes, digestive tract, and respiratory system. Metallic dust vapors may form a fire hazard when exposed to heat, flame, or when in contact with oxidizing agents. Prior to performing any metal machining process, personnel shall consult their local safety and health staff and the Material Safety Data Sheet (MSDS) to become familiar with the hazards and protective measures for a specific metal.

**MOVING ENGINE**

Do not move an engine on work stand rails or transportation trailer without having installed proper supports, tie-rods, and flange adapters. Engine may shift or fall off rails and cause injury to personnel. When moving engine, do not push on engine. Use the engine support mount assemblies as a push point.

**PACKING LUBRICATION (OIL AND FUEL SYSTEMS)**

Use only the lubricant specified in the technical order to lubricate fuel and oil system packings. Use of an incompatible lubricant can cause oil foaming, clogging of critical fuel system filters, and packing deterioration leading to leakage, possible fire and engine shutdown.

**PROTECTIVE CLOSURES AND COVERS**

Install protective closures on all plumbing and components immediately upon removal. Install protective covers on engine modules, assemblies, parts, and compartments when not being worked.

**QUICK RELEASE PINS**

Do not force quick release pins into place as this may damage the self-locking feature of the pins. The compatibility of quick release pins is determined by the part number. Intermixing of pin part numbers during installation can result in loss of or failure of the quick release pins.

**SHARP EDGED BLADES**

Many blades have sharp edges. Wear protective gloves when handling bladed rotors and when installing or removing blades from rotors. Blades should only be used in their designed holder or rotor.

**SAFETY SUMMARY (continued)**

**SUPER-CHILLED/HEATED PARTS AND EQUIPMENT**

Super-chilled or heated parts and the equipment or agents used to heat or chill can cause burns, frostbite, or both. Wear temperature resistant gloves and other related protective clothing/equipment when handling chilled or heated parts or equipment. Super-chilled parts are fragile due to a lower resistance to impact. Heating parts beyond specified temperature limits can degrade heat treat qualities and result in part failure.

**TEMPERATURE NORMALIZING**

Allow heated or chilled parts to reach room temperature before applying final torque to fasteners. Failure to comply may result in improperly seated parts and/or mistorqued fasteners.

**WORK BOLTS AND WORK NUTS**

Work bolts and work nuts shall be permanently marked to distinguish them from engine bolts and nuts. Do not apply lubricants to work bolts and work nuts that will be replaced by engine bolts and nuts which require a thread sealant. Sealants will not adhere to threads contaminated with lubricants.



**WORK PACKAGE****ALPHABETICAL INDEX****GEARBOX MODULE****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

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Removal - - - - -	028 00
Housing Assembly Separation of Front and Rear - - - - -	012 00
Housing Baffle and Baffle Assembly, Gearbox	
Inspection - - - - -	330 00
<b>I</b>	
Impeller, Gearbox Deaerator	
Inspection - - - - -	323 00
Installation - - - - -	602 00
Removal - - - - -	014 00
Repair - - - - -	423 00
Insert, Screw Thread (Seal Drain)	
Installation - - - - -	703 00
Removal - - - - -	011 00
<b>L</b>	
Limits, Table of - - - - -	801 00
<b>N</b>	
Nozzle, Gearbox Bearing	
Installation - - - - -	703 00
Removal - - - - -	014 00
Inspection - - - - -	337 00
	338 00
Nozzle, Gearbox Bearing (Reduction Gearbox)	
Installation - - - - -	606 00
Removal - - - - -	028 00
Inspection - - - - -	333 00
Repair - - - - -	410 00
Nozzle, Gearbox Oil	
Installation - - - - -	702 00
	703 00
Removal - - - - -	014 00
Inspection - - - - -	338 00
<b>O</b>	
Oil Seal Retainer Assembly, Gearbox	
Inspection - - - - -	304 00
Installation - - - - -	702 00
Removal - - - - -	014 00

## ALPHABETICAL INDEX (continued)

Subject	WP No.
<b>P</b>	
Plate Assembly, Retaining, Gearbox Bearing	
Inspection - - - - -	327 00
Installation - - - - -	702 00
Removal - - - - -	024 00
Repair - - - - -	407 00
Plate, Retaining, Gearbox Bearing	
Inspection - - - - -	328 00
Installation - - - - -	702 00
Removal - - - - -	014 00
Pump Assembly, Main Oil	
Installation - - - - -	707 00
Removal - - - - -	011 00
Pump Assembly, Scavenge, No. 2 and 3 Bearing (Gearbox)	
Installation - - - - -	707 00
Removal - - - - -	011 00
<b>R</b>	
Race and Rollers, Bearing Inner	
Inspection - - - - -	303 00
Installation - - - - -	605 00
Removal - - - - -	027 00
Race, Bearing Inner (Gearbox Spur Gear)	
Inspection - - - - -	303 00
Installation - - - - -	701 00
Removal - - - - -	026 00
Race, Bearing Inner	
Inspection - - - - -	303 00
Installation - - - - -	605 00
Removal - - - - -	027 00
Race, Bearing Outer (Gearbox Spur Gearshaft)	
Inspection - - - - -	303 00
Installation - - - - -	702 00
Removal - - - - -	014 00
Race, Bearing Outer	
Inspection - - - - -	303 00
Installation - - - - -	605 00
Removal - - - - -	027 00
Race, Inner Gearbox Spur Bevel Gearshaft	
Inspection - - - - -	303 00
Installation - - - - -	703 00
Removal - - - - -	012 00
Race, Inner, and Rollers, Bearing Gearbox Spur Bevel Gearshaft	
Inspection - - - - -	303 00
Installation - - - - -	703 00
Removal - - - - -	023 00

## ALPHABETICAL INDEX (continued)

Subject	WP No.
Retainer Assembly (Reduction) Gearbox, Oil Seal	
Assembly - - - - -	606 00
Disassembly - - - - -	028 00
Inspection - - - - -	339 00
Installation - - - - -	605 00
Removal - - - - -	028 00
Repair - - - - -	406 00
Retainer, Oil Seal, Gearbox (Deaerator Impeller Shaft)	
Assembly - - - - -	601 00
Cleaning - - - - -	201 00
Disassembly - - - - -	021 00
Inspection - - - - -	304 00
Installation - - - - -	705 00
Removal - - - - -	011 00
Retainer, Oil Seal, Gearbox (Gearbox Spur Bevel Gearshaft)	
Assembly - - - - -	601 00
Cleaning - - - - -	201 00
Disassembly - - - - -	021 00
Inspection - - - - -	304 00
Installation - - - - -	705 00
Removal - - - - -	011 00
Retainer (Reduction) Gearbox, Oil Seal	
Installation - - - - -	606 00
Removal - - - - -	028 00
<b>S</b>	
Screen, Protective, Gearbox Sump Cover	
Inspection - - - - -	342 00
Installation - - - - -	703 00
Removal - - - - -	014 00
Seal Assembly, Face (Deaerator Impeller Shaft)	
Assembly - - - - -	607 00
Cleaning - - - - -	201 00
Disassembly - - - - -	029 00
Inspection - - - - -	306 00
Installation - - - - -	601 00
Removal - - - - -	021 00
Repair - - - - -	404 00
Seal Assembly, Face (Reduction Gearbox)	
Cleaning - - - - -	201 00
Inspection - - - - -	306 00
Installation - - - - -	601 00
Removal - - - - -	021 00
Repair - - - - -	404 00

## ALPHABETICAL INDEX (continued)

Subject	WP No.
Seal Assembly, Face (Gearbox Drive Spur Bevel Gearshaft)	
Assembly - - - - -	608 00
Cleaning - - - - -	201 00
Disassembly - - - - -	030 00
Inspection - - - - -	306 00
Installation - - - - -	601 00
Removal - - - - -	021 00
Repair - - - - -	404 00
Seal Assembly, Face, (Reduction Gearbox)	
Cleaning - - - - -	201 00
Installation - - - - -	606 00
Inspection - - - - -	306 00
Removal - - - - -	028 00
Repair - - - - -	404 00
Seat, Gearbox Bearing Seal Gearbox Spur Bevel Gearshaft	
Installation - - - - -	603 00
Removal - - - - -	023 00
Seat, Seal (Gearbox Spur Bevel Gearshaft Bearing)	
Cleaning - - - - -	201 00
Installation - - - - -	703 00
Removal - - - - -	012 00
Seat, Reduction Gearbox Bearing Seal	
Cleaning - - - - -	201 00
Inspection - - - - -	309 00
Installation - - - - -	606 00
Removal - - - - -	011 00
Repair - - - - -	409 00
Screen, Protective, Gearbox Sump Cover	
Installation - - - - -	703 00
Removal - - - - -	014 00
Inspection - - - - -	340 00
Shaft, Gearbox Deaerator Impeller	
Cleaning - - - - -	201 00
Inspection - - - - -	317 00
Installation - - - - -	703 00
Removal - - - - -	014 00
Repair - - - - -	417 00
Shaft, Gearbox Deaerator Impeller, and Bearing Assembly	
Assembly - - - - -	602 00
Disassembly - - - - -	022 00
Installation - - - - -	703 00
Removal - - - - -	014 00
Repair - - - - -	417 00

## ALPHABETICAL INDEX (continued)

Subj	WP No.
Shaft, Gearbox Idler Gear	
Inspection - - - - -	316 00
Installation - - - - -	701 00
Removal - - - - -	026 00
Repair - - - - -	416 00
Sleeve, Sealing, Gearbox	
Inspection - - - - -	325 00
Installation - - - - -	605 00
Removal - - - - -	027 00
Spacer (Reduction) Gearbox Bearing Inner	
Inspection - - - - -	321 00
Installation - - - - -	606 00
Removal - - - - -	028 00
Spacer, (Reduction) Gearbox Bearing, Outer	
Inspection - - - - -	321 00
Installation - - - - -	606 00
Removal - - - - -	028 00
<b>T</b>	
Table of Limits - - - - -	801 00
Tube, Scavenge, Gearbox	
Cleaning - - - - -	201 00
Installation - - - - -	703 00
Removal - - - - -	014 00
Inspection - - - - -	336 00
Tube, Transfer, Gearbox Bearing	
Inspection - - - - -	329 00
Installation - - - - -	702 00
Removal - - - - -	014 00
Repair - - - - -	429 00
Tube, Transfer	
Installation - - - - -	702 00
Removal - - - - -	014 00
Inspection - - - - -	338 00
Tube Assembly, (Oil Filter) Transfer	
Cleaning - - - - -	201 00
Inspection - - - - -	302 00
Installation - - - - -	707 00
Removal - - - - -	011 00
Tube Assembly, Pressure, Oil Pump Idler Bearing	
Installation - - - - -	702 00
Removal - - - - -	011 00

ALPHABETICAL INDEX (continued)

Subject	WP No.
Tube Assembly, Scavenge, Main Oil Pump	
Cleaning - - - - -	201 00
Inspection - - - - -	301 00
Installation - - - - -	707 00
Removal - - - - -	011 00
Repair - - - - -	401 00
Tubes, Gearbox External	
Inspection - - - - -	301 00
Repair - - - - -	401 00

V

Valve Assembly, Breather Pressurizing	
Inspection - - - - -	331 00
Installation - - - - -	707 00
Removal - - - - -	011 00
Valve, Fluid Check	
Installation - - - - -	705 00
Removal - - - - -	011 00

# WORK PACKAGE

## INTRODUCTION

## GEARBOX MODULE

EFFECTIVITY: ENGINE MODEL F100-PW-229

### LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 . . . . .	18	7 . . . . .	14	10 Blank . . . . .	0
2 . . . . .	0	8 . . . . .	1	11 . . . . .	0
3 . . . . .	18	9 . . . . .	14	12 Blank . . . . .	14
4 - 6 . . . . .	1				

**1. INTRODUCTION.**

- a. This technical order provides depot maintenance instructions for the gearbox module.

**2. CONTENTS, ARRANGEMENT, AND NUMBERING OF WORK PACKAGES.**

- a. This technical order contains work packages and subordinate work packages (if applicable) arranged in separate groups for disassembly, cleaning, inspection, repair, and assembly functions.
- b. A block of five digit numbers has been reserved for each group. For example, the block of numbers reserved for the inspection group is 300 00 through 399 00. Similarly, the block of numbers for the repair group is 400 00 through 599 00. Each block contains enough numbers to allow for expansion.
- c. The numbers within each block identify a work package or subordinate work package. The first three digits identify a work package, the last two digits identify a subordinate work package. For example, 562 00 and 563 00 are typical work package numbers; 562 01, 562 02, and 563 01 are typical subordinate work package numbers.

- d. The first work package in a group is the introductory work package. This work package provides a listing of all the work packages within the group by title and number. The work package groups in this manual are as follows:

<b>WP Block Numbers</b>	<b>Functional Group</b>
001 00	Alphabetical Index
002 00	Introduction
003 00 through 009 00	Gearbox Module Removal and Installation in Shipping Container and Preservation
010 00 through 019 00	Gearbox Module Disassembly
020 00 through 199 00	Disassembly of Subassemblies
200 00 through 299 00	Cleaning
300 00 through 399 00	Inspection
400 00 through 599 00	Repair
600 00 through 699 00	Assembly of Subassemblies
700 00 through 799 00	Final Assembly
800 00 through 801 00	Table of Limits and Clearance Charts



**3. PICTORIAL INDEX.**

(See FO-1, FO-2, and Table 1.)

- a. A pictorial index is presented to identify each WP and associated assemblies and parts requiring depot maintenance.

**4. LEADING PARTICULARS OF GEARBOX MODULE.**

- a. The following is a list of leading particulars for the Gearbox Module.

**GEARBOX MODULE**

Length:	27 inches
Width:	21 inches
Height:	9 inches
Weight:	96 pounds (dry weight)

**5. TYPICAL PART NUMBER.**

- a. When the word typical precedes a part number it means that this part number is one of several that may be used in this location. By referring to this typical part number in the Illustrated Parts Breakdown (IPB) manual (T.O. 2J-F100-54 for F100-PW-229), all part numbers applicable to this location can be found. When a part number is used without the word typical, it means that the procedure applies only to that part number.

**6. CHANGE REQUEST.**

- a. Recommendations for specific changes to this technical order (TO) shall be submitted on an AFTO Form 22 to SA-ALC/LPCQ (TOMA), Kelly AFB, TX 78241-6421 in accordance with T.O. 00-5-1.

**7. LOCALLY MANUFACTURED SUPPORT EQUIPMENT.**

- a. Locally manufactured support equipment may be manufactured by the using activity or by a supplier.
- b. Locally manufactured support equipment is listed in the Master Numerical List of Support Equipment in T.O. 2J-F100-53-3, and the Applicable Support Equipment and Illustrated Support Equipment sections of maintenance WPs/SWPs.
- c. Locally manufactured support equipment is identified in these WPs/SWPs by the prefix LM and a four digit number (LM 0123), or by the prefix LM followed by the PWA number (LM PWA 51203).
- d. When an LM tool is identified in a maintenance WP/SWP, all data required to make the tool will be found in T.O. 2J-F100-53-3, WP 050 00.

Table 1. Gearbox Module - Pictorial Index

INDEX NO.	NAME	REM	DISASSY	CLEAN	INSP	REPAIR	ASSY	INSTL	OTHER
1	GEARBOX MODULE		011 00 012 00 013 00 014 00				701 00 703 00 704 00 705 00		a*
2	COUPLING, REMOTE GEARBOX DRIVESHAFT	011 00			332 00	432 00		707 00	
3	COVER, PACKING, GEARBOX	011 00		201 00	305 00	403 00		705 00	
4	RETAINER, OIL SEAL, GEARBOX (GEARBOX DRIVE SPUR BEVEL GEARSHAFT)	011 00	021 00	201 00	304 00	406 00	601 00	705 00	
5	SEAL ASSEMBLY, FACE (GEARBOX DRIVE SPUR BEVEL GEARSHAFT)	021 00	030 00	201 00	306 00	404 00	608 00	602 00	
6	VALVE ASSEMBLY, BREATHING PRESSURIZING	011 00			331 00			707 00	
7	RETAINER, OIL SEAL, GEARBOX (DEAERATOR IMPELLER SHAFT)	011 00	021 00	201 00	304 00	406 00	601 00	705 00	
8	SEAL ASSEMBLY, FACE (DEAERATOR IMPELLER SHAFT)	021 00	029 00	201 00	306 00	404 00	607 00	602 00	
9	INSERT, SCREW THREAD (SEAL DRAIN)	011 00			334 00	412 00		705 00	
10	TUBE ASSEMBLY, PRESSURE OIL PUMP IDLER BEARING	011 00			SEE NOTE	401 00		702 00	
11	FILTER, OIL	011 00	SEE NOTE	SEE NOTE	SEE NOTE	SEE NOTE	SEE NOTE	707 00	
12	TUBE ASSEMBLY, (OIL FILTER) TRANSFER	011 00		201 00	301 00	401 00		707 00	
13	CONNECTOR, TUBE, OIL TANK SCAVENGE	011 00		201 00	301 00	401 00		707 00	

**NOTE**

REFER TO FOLLOWING TECHNICAL ORDERS:

- TUBE ASSEMBLY, PRESSURE OIL PUMP IDLER BEARING T.O.2J-F100-53-5 WPs 401 00 and 404 00.
- BRACKET, LOOP CLAMP T.O. 2J-F100-53-5 WP 405 00.
- MAIN OIL PUMP: T.O. 7J4-2-51-3
- NO. 2 AND 3 BEARING (GEARBOX) SCAVENGE PUMP: T.O. 7J4-2-50-3
- OIL FILTER: T.O. 7J2-27-3

a\* WP 004 00 GEARBOX MODULE SHIPPING CONTAINER - REMOVAL  
 WP 005 00 GEARBOX MODULE SHIPPING CONTAINER - INSTALLATION  
 WP 006 00 GEARBOX MODULE - PRESERVATION

Table 1. Gearbox Module - Pictorial Index (continued)

INDEX NO.	NAME	REM	DISASSY	CLEAN	INSP	REPAIR	ASSY	INSTL	OTHER
14	TUBE ASSEMBLY, SCAVENGE, MAIN OIL PUMP	011 00		201 00	301 00	401 00		707 00	
15	PUMP ASSEMBLY, MAIN	011 00	SEE NOTE	SEE NOTE	SEE NOTE	SEE NOTE	SEE NOTE	707 00	
16	PUMP ASSEMBLY, SCAVENGE, NO. 2 AND 3 BEARING (GEARBOX)	011 00	SEE NOTE	SEE NOTE	SEE NOTE	SEE NOTE	SEE NOTE	707 00	
17	PLATE, COMPANY NAME								
18	DETECTOR, METAL CHIP, OIL SUMP	011 00		201 00	302 00			705 00	
19	VALVE, FLUID CHECK	011 00			334 00			705 00	
20	GEARBOX ASSEMBLY, REDUCTION	011 00	028 00				606 00	705 00	
21	BEARING OUTER RACE, GEARBOX DEARATOR IMPELLER SHAFT	013 00		201 00	303 00			701 00	
22	HOUSING ASSEMBLY, GEARBOX FRONT	012 00	013 00	201 00	312 00	412 00	701 00	704 00	
23	BEARING OUTER RACE, GEARBOX DRIVE SPUR BEVEL GEARSHAFT	013 00		201 00	303 00			701 00	
24	GEAR, SPUR, GEARBOX, AND SHAFT, GEARBOX IDLER GEAR	013 00	026 00				701 00	701 00	
25	SHAFT, GEARBOX IDLER GEAR	026 00		201 00	316 00	416 00		701 00	
26	BEARING, ROLLER, (GEARBOX IDLER GEAR SHAFT)	026 00		201 00	303 00			701 00	
27	GEAR, SPUR, GEARBOX (GEARBOX IDLER GEAR SHAFT)	026 00		201 00	320 00	420 00		701 00	
28	RACE, BEARING INNER (GEARBOX IDLER GEAR SHAFT)	026 00		201 00				701 00	
29	RACE, INNER, AND ROLLERS, BEARING (GEARBOX DRIVE SPUR BEVEL GEARSHAFT)	023 00		201 00	303 00			603 00	
30	GEAR, GEARBOX DRIVE SPUR BEVEL GEARSHAFT	023 00		201 00	319 00	419 00		603 00	
31	GEARSHAFT ASSEMBLY, BEVEL, SPUR, GEARBOX DRIVE	014 00		201 00	314 00	414 00		703 00	
32	RACE, INNER (GEARBOX DRIVE SPUR BEVEL GEARSHAFT BEARING) (INNER HALF)	023 00		201 00	303 00			703 00	
33	HOUSING ASSEMBLY, GEARBOX (REAR)	012 00	014 00	201 00	310 00	402 00	703 00	704 00	

Table 1. Gearbox Module - Pictorial Index (continued)

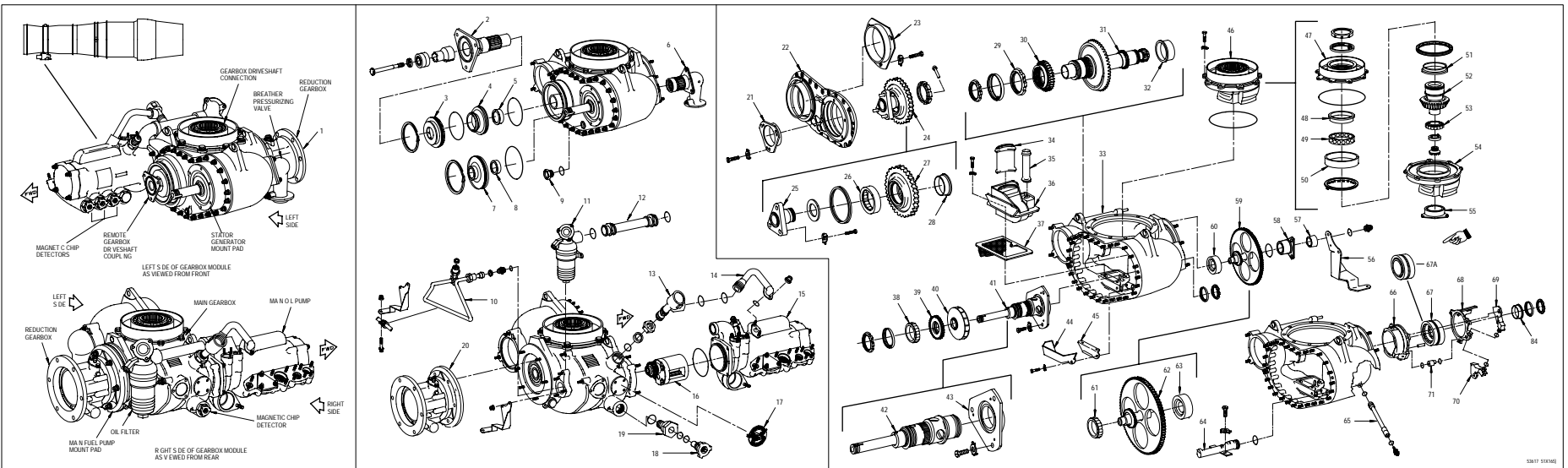
INDEX NO.	NAME	REM	DISASSY	CLEAN	INSP	REPAIR	ASSY	INSTL	OTHER
34	TUBE, SCAVENGE, GEARBOX	014 00		201 00	336 00	429 00		703 00	
35	TUBE, SCAVENGE, GEARBOX	014 00		201 00	336 00	429 00		703 00	
36	COVER ASSEMBLY, GEARBOX SUMP	014 00		201 00	326 00			703 00	
37	SCREEN ASSEMBLY, PROTECTIVE, GEARBOX SUMP COVER	014 00			342 00			703 00	
38	BEARING, INNER RACE AND ROLLERS (DEAERATOR IMPELLER SHAFT)	014 00		201 00	303 00			602 00	
39	GEAR, GEARBOX (DEAERATOR IMPELLER SHAFT)	014 00		201 00	322 00	422 00		602 00	
40	IMPELLER, GEARBOX DEAERATOR	014 00		201 00	323 00	423 00		602 00	
41	SHAFT GEARBOX (DEAERATOR) IMPELLER, AND BEARING ASSEMBLY	014 00	022 00				602 00	703 00	
42	SHAFT, GEARBOX DEAERATOR IMPELLER	014 00		201 00	317 00	417 00		703 00	
43	BEARING, GEARBOX DEAERATOR IMPELLER SHAFT	022 00		201 00	303 00			702 00	
44	BAFFLE ASSEMBLY, GEARBOX	014 00		201 00	330 00	430 00		704 00	
45	BAFFLE, GEARBOX HOUSING	014 00			330 00	408 00		704 00	
46	GEARSHAFT ASSEMBLY, BEVEL GEARBOX	014 00	027 00				605 00	703 00	
47	SLEEVE, SEALING, GEARBOX	027 00		201 00	325 00			605 00	
48	RACE, BEARING INNER (GEARBOX BEVEL GEARSHAFT)	027 00		201 00				605 00	
49	CAGE AND BALLS, BEARING (GEARBOX BEVEL GEARSHAFT)	027 00		201 00	303 00			605 00	
50	RACE, BEARING OUTER (GEARBOX BEVEL GEARSHAFT)	027 00		201 00				605 00	
51	RACE, BEARING INNER (GEARBOX BEVEL GEARSHAFT)	027 00		201 00				605 00	
52	GEARSHAFT, BEVEL, GEARBOX	027 00		201 00	318 00	418 00		605 00	

Table 1. Gearbox Module - Pictorial Index (continued)

INDEX NO.	NAME	REM	DISASSY	CLEAN	INSP	REPAIR	ASSY	INSTL	OTHER
53	RACE AND ROLLERS, BEARING INNER (GEARBOX BEVEL GEARSHAFT)	027 00		201 00	303 00			605 00	
54	COVER ASSEMBLY, GEARBOX UPPER	027 00		201 00	324 00	424 00		703 00	
55	BEARING, ROLLER, GEARBOX GEAR (GEARBOX BEVEL GEARSHAFT)	027 00		201 00				605 00	
56	BRACKET, LOOP CLAMP	014 00			SEE NOTE			702 00	
57	RACE, INNER (GEARBOX DRIVE SPUR BEVEL GEARSHAFT BEARING) (OUTER HALF)	012 00			303 00			703 00	
58	HOUSING, GEARBOX BEARING	014 00		201 00	335 00			702 00	
59	GEARSHAFT, ASSEMBLY (GEARBOX SPUR)	014 00	025 00	201 00	313 00	413 00	604 00	702 00	
60	RACE, BEARING OUTER (GEARBOX SPUR GEARSHAFT)	014 00		201 00	303 00			702 00	
61	BEARING, ROLLER, GEARSHAFT (GEARBOX SPUR GEARSHAFT)	025 00						604 00	
62	GEARSHAFT, SPUR GEARBOX	014 00	025 00	201 00	313 00	413 00	604 00	702 00	
63	BEARING, BALL, GEARSHAFT (GEARBOX SPUR GEARSHAFT)	025 00						604 00	
64	NOZZLE, GEARBOX BEARING	014 00			337 00			702 00	
65	TUBE, TRANSFER, GEARBOX BEARING	014 00			338 00	429 00		702 00	
66	PLATE, RETAINING, GEARBOX BEARING	024 00		201 00	327 00	407 00		702 00	
67	BEARING, ASSEMBLY (GEARBOX DRIVE SPUR BEVEL GEARSHAFT)(SPLIT INNER RACE)	014 00						703 00	
67A	BEARING, ASSEMBLY (GEARBOX DRIVE SPUR BEVEL GEARSHAFT) (ONE PIECE INNER RACE)	014 01						703 01	
68	PLATE, RETAINING, GEARBOX BEARING	014 00		201 00	328 00			702 00 703 00	
69	OIL NOZZLE, GEAR PUMP	014 00						702 00 703 00	
70	OIL NOZZLE, GEAR PUMP	014 00			338 00			702 00 703 00	
71	TUBE, TRANSFER, GEARBOX BEARING	014 00			301 00	429 00		702 00	
72	GEAR, INTERNAL, MAIN FUEL PUMP DRIVE	028 00		201 00	315 00	415 00		606 00	

Table 1. Gearbox Module - Pictorial Index (continued)

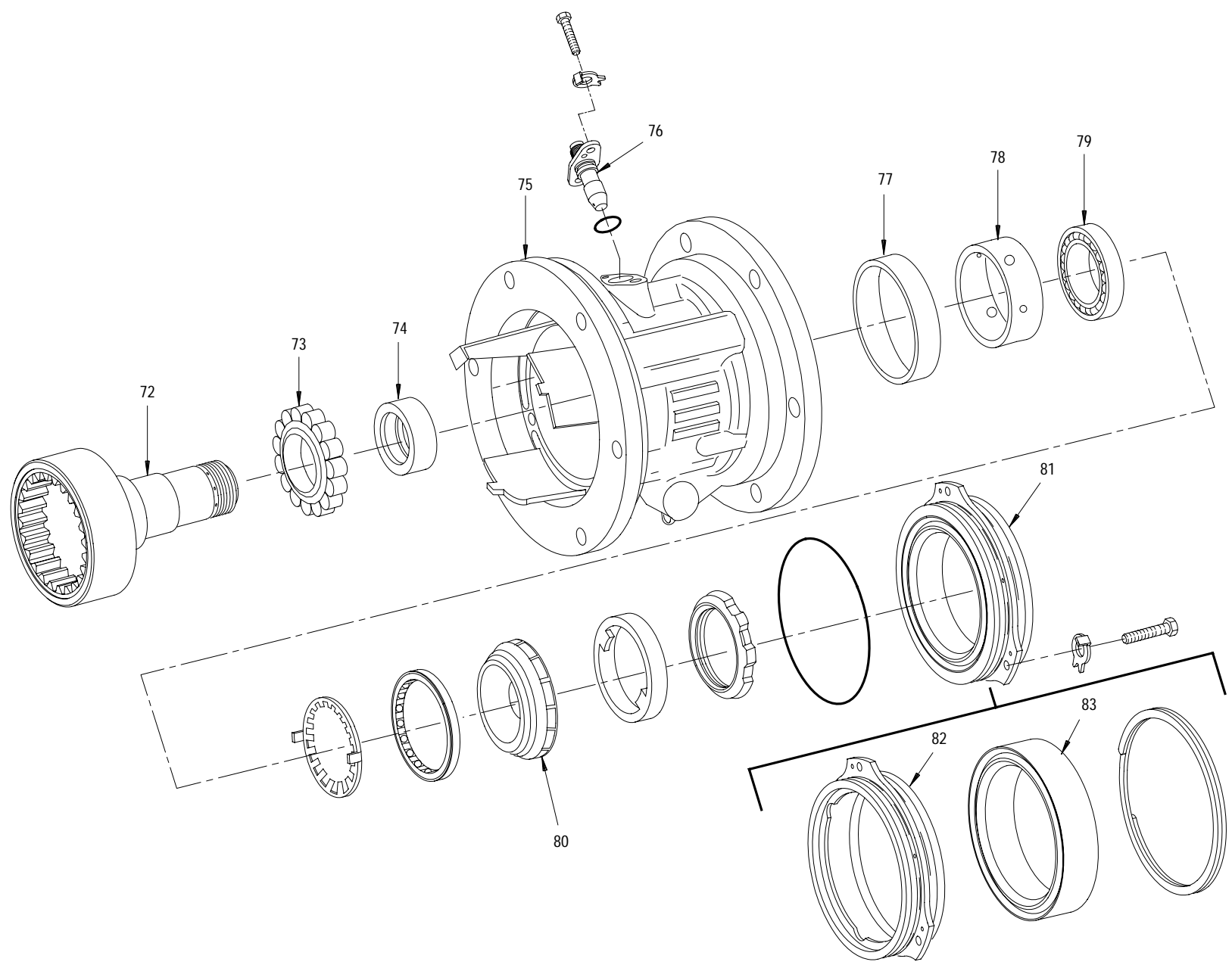
INDEX NO.	NAME	REM	DISASSY	CLEAN	INSP	REPAIR	ASSY	INSTL	OTHER
73	BEARING, INNER RACE AND ROLLERS (REDUCTION GEARBOX)	028 00		201 00				606 00	
74	SPACER, (REDUCTION) GEARBOX BEARING, INNER	028 00		201 00	321 00			606 00	
75	HOUSING ASSEMBLY, REDUCTION GEARBOX	028 00		201 00	311 00			606 00	
76	NOZZLE, GEARBOX BEARING (REDUCTION GEARBOX)	028 00		201 00	333 00	410 00		606 00	
77	BEARING, ROLLER, OUTER RACE (REDUCTION GEARBOX)	028 00		201 00				606 00	
78	SPACER, (REDUCTION) GEARBOX BEARING, OUTER	028 00		201 00	321 00			606 00	
79	BEARING, BALL (REDUCTION GEARBOX)	028 00		201 00				606 00	
80	SEAT, (REDUCTION) GEARBOX BEARING SEAL	028 00		201 00				606 00	
81	RETAINER ASSEMBLY, (REDUCTION) GEARBOX, OIL SEAL	028 00	028 00				606 00	606 00	
82	RETAINER, (REDUCTION) GEARBOX, OIL SEAL	028 00		201 00	339 00			606 00	
83	SEAL ASSEMBLY, FACE, (REDUCTION GEARBOX)	028 00		201 00	306 00	404 00		606 00	
84	RACE, INNER (GEARBOX DRIVE SPUR BEVEL GEARSHAFT BEARING) (OUTER HALF)	012 00		201 00	303 00			703 00	



FO-1. Gearbox Module Pictorial Index







JL173X1\_FO (51X64)

FO-2. Gearbox Module Pictorial Index



# WORK PACKAGE

## INTRODUCTION

### GEARBOX MODULE - SHIPPING CONTAINER

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2					
					0

**1. INTRODUCTION.**

- a. This work package introduces the 003 00 through 009 00 series of work packages for the gearbox module. The following work packages are included in this series:

<b>WP No.</b>	<b>Title</b>
004 00	Gearbox Module Shipping Container - Removal
005 00	Gearbox Module Shipping Container - Installation
006 00	Gearbox Module - Preservation
007 00 through 009 00	Open

# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARBOX MODULE SHIPPING CONTAINER -

#### REMOVAL

EFFECTIVITY: ENGINE MODEL F100-PW-229

### LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	14	4	0		

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	GEARBOX MODULE - REMOVAL FROM SHIPPING CONTAINER	
	GEARBOX MODULE, REMOVAL FROM SHIPPING CONTAINER - -	
	FIXTURE, HANDLING, MAIN GBX MODULE AND FUEL PUMP -	PWA 56579
		OR
	FIXTURE, GEARBOX HANDLING - - - - -	PWA 57071

ILLUSTRATED SUPPORT EQUIPMENT

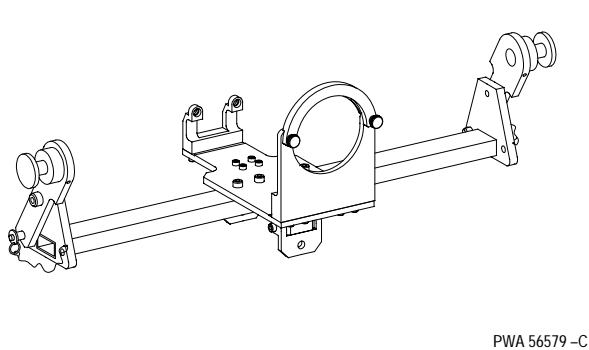


Figure T1. PWA 56579 FIXTURE

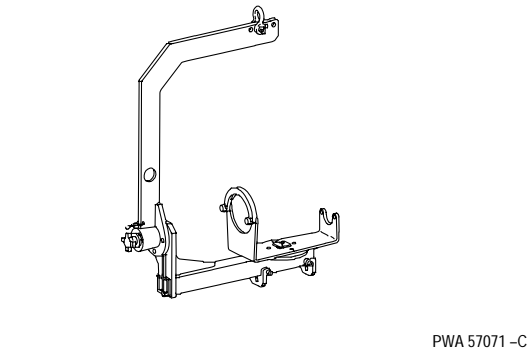


Figure T2. PWA 57071 FIXTURE

**1. INTRODUCTION.**

- a. This work package contains instructions for removing the gearbox module from the metal shipping container.

**2. GEARBOX MODULE - REMOVAL FROM SHIPPING CONTAINER.**

(See Figure 1.)

- a. Release all pressure from container before opening by loosening air pressure relief valve(5, figure 1).
- b. Remove lockwire with lead seals(2), bolts(7), hexnuts(9), and lockwasher(8) from container base(6) and top(1) at eight locations.
- c. Remove container top(1).

**NOTE**

For PWA 56579 handling fixture, refer to step d. For PWA 57071 handling fixture, refer to step e.

- d. Install PWA 56579 handling fixture on gearbox module(3) as follows:
  - (1) Remove support clamp from PWA 56579 prior to installation.
  - (2) Position two retainer lugs over two nuts securing reduction gearbox assembly to main gearbox housing. Tilt fixture slightly to slip over nuts.

- (3) Install opposite end of tool into PTO housing groove. Reinstall support clamp and secure hand knobs.

- (4) Adjust trunion arms as required to optimize center of gravity.

- e. Install PWA 57071 handling fixture on gearbox module(3) as follows:

- (1) Align fixture bracket holes with reduction gearbox drive pad nuts. Attach fixture support clamp to main gearbox at grooved boss of starter mount pad. Secure with two hand knobs.

- (2) Attach separable overhead handling arm to fixture by sliding arm on fixture pivot journal and securing with ball lock pin. Attach hoist to handling arm.

- f. Remove three quick-release pins(4). Lift gearbox module from container.

- g. Assemble container details and store for future use.

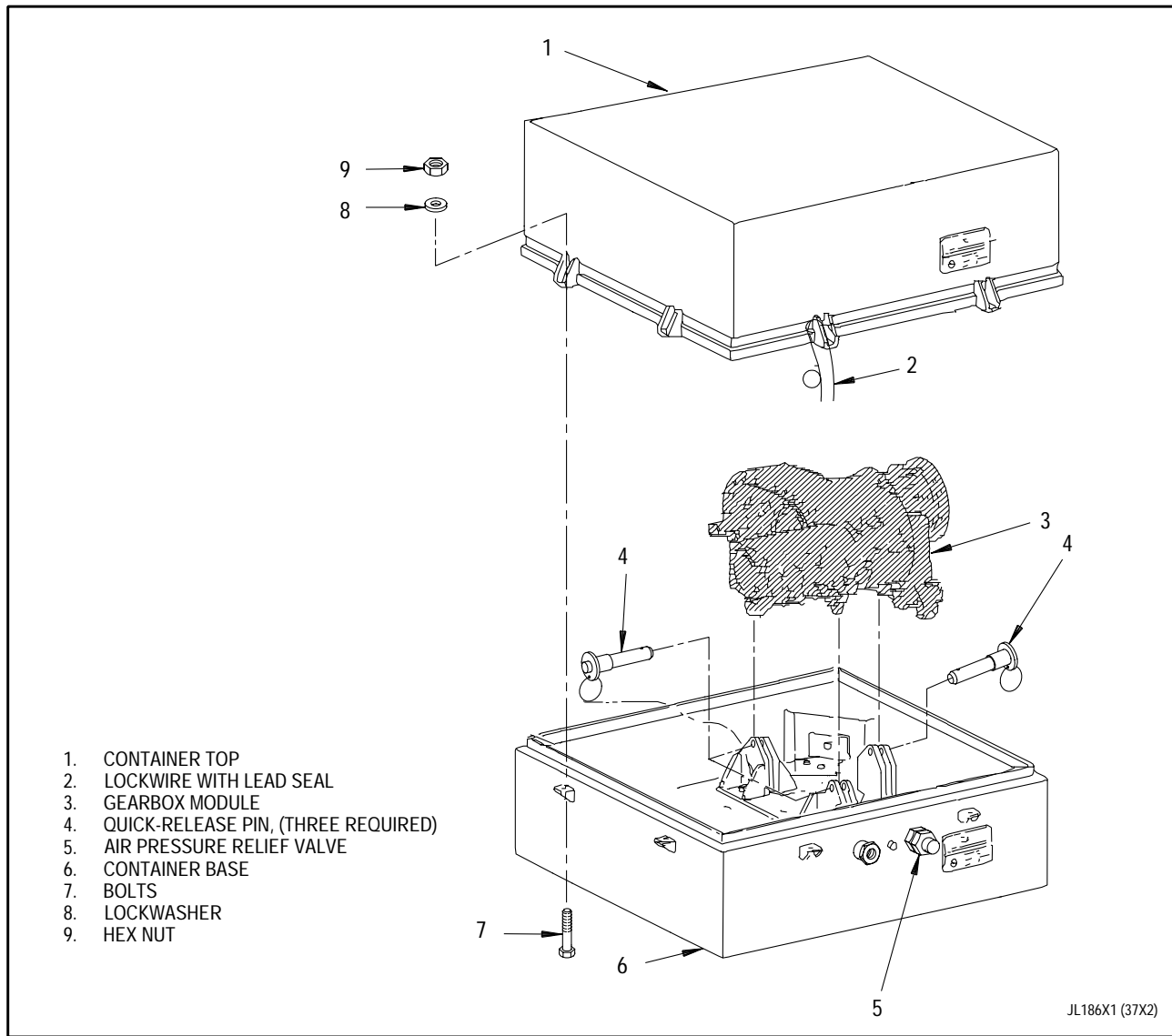


Figure 1. Gearbox Module Shipping Container



**WORK PACKAGE****TECHNICAL PROCEDURES****GEARBOX MODULE SHIPPING CONTAINER -****INSTALLATION****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2 . . . . .	20	5 . . . . .	14	7 Added . . . . .	20
3 . . . . .	14	6 . . . . .	20	8 Blank Added . . . . .	20
4 . . . . .	20				

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
DESICCANT	P8320
LEAD SEAL	83280
LOCKWIRE	MS20995-C41
TAPE, PRESSURE SENSITIVE	P24048

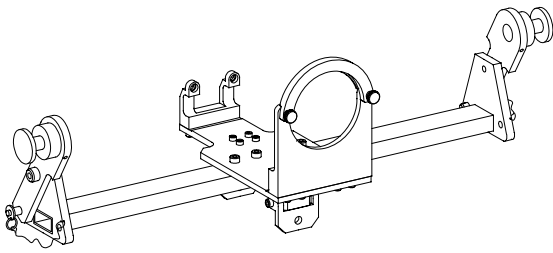
EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
LOCKWASHER, SPRING	MS35338-46	16
PACKING, PREFORMED	P50326	1

APPLICABLE SUPPORT EQUIPMENT

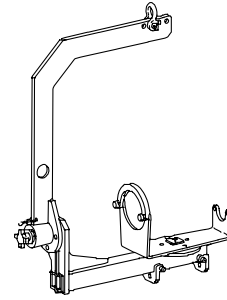
Paragraph	Function - Tool Nomenclature	Tool Number
2	GEARBOX MODULE - INSTALLATION INTO SHIPPING CONTAINER	
	FIXTURE, HANDLING, MAIN GBX MODULE AND FUEL PUMP - -	PWA 56579
		OR
	FIXTURE, GEARBOX HANDLING - - - - -	PWA 57071

**ILLUSTRATED SUPPORT EQUIPMENT**



PWA 56579 -C

**Figure T1. PWA 56579 FIXTURE**



PWA 57071 -C

**Figure T2. PWA 57071 FIXTURE**

## 1. INTRODUCTION.

- a. This work package contains instructions for installation of gearbox module into shipping container.

## 2. GEARBOX MODULE - INSTALLATION INTO SHIPPING CONTAINER.

(See Figures 1 and 2.)

### NOTE

P4078971 shipping container is a universal shipping container that can be used to ship gearboxes of any F100 configuration. P4070543 shipping container is used for F100-PW-229 gearboxes only.

- a. Prepare shipping container as follows:
  - (1) Remove and discard old desiccant(10, figure 1).
  - (2) Clean interior of container(1 and 8).
  - (3) Check packing(3) and mating surfaces for conditions which could cause leakage.
  - (4) Correct any problems.

### NOTE

For PWA 56579 handling fixture, refer to step b. For PWA 57071 handling fixture, refer to step c.

- b. Install PWA 56579 handling fixture on gearbox module(4) as follows:
  - (1) Remove support clamp prior to installation.
  - (2) Position two retainer lugs over two nuts securing reduction gearbox assembly to main gearbox housing. Tilt fixture slightly to slip over nuts.
  - (3) Install opposite end of tool into PTO housing groove. Reinstall support clamp and secure hand knobs.

- (4) Adjust trunion arms as required to optimize center of gravity.

- c. Install PWA 57071 handling fixture on gearbox module(4) as follows:

- (1) Align fixture bracket holes with reduction gearbox drive pad nuts. Attach fixture support clamp to main gearbox at grooved boss of starter mount pad. Secure with two hand knobs.

- (2) Attach separable overhead handling arm to fixture by sliding arm on fixture pivot journal and securing with ball lock pin. Attach hoist to handling arm.

- d. Rotate gearbox module to lug down position.

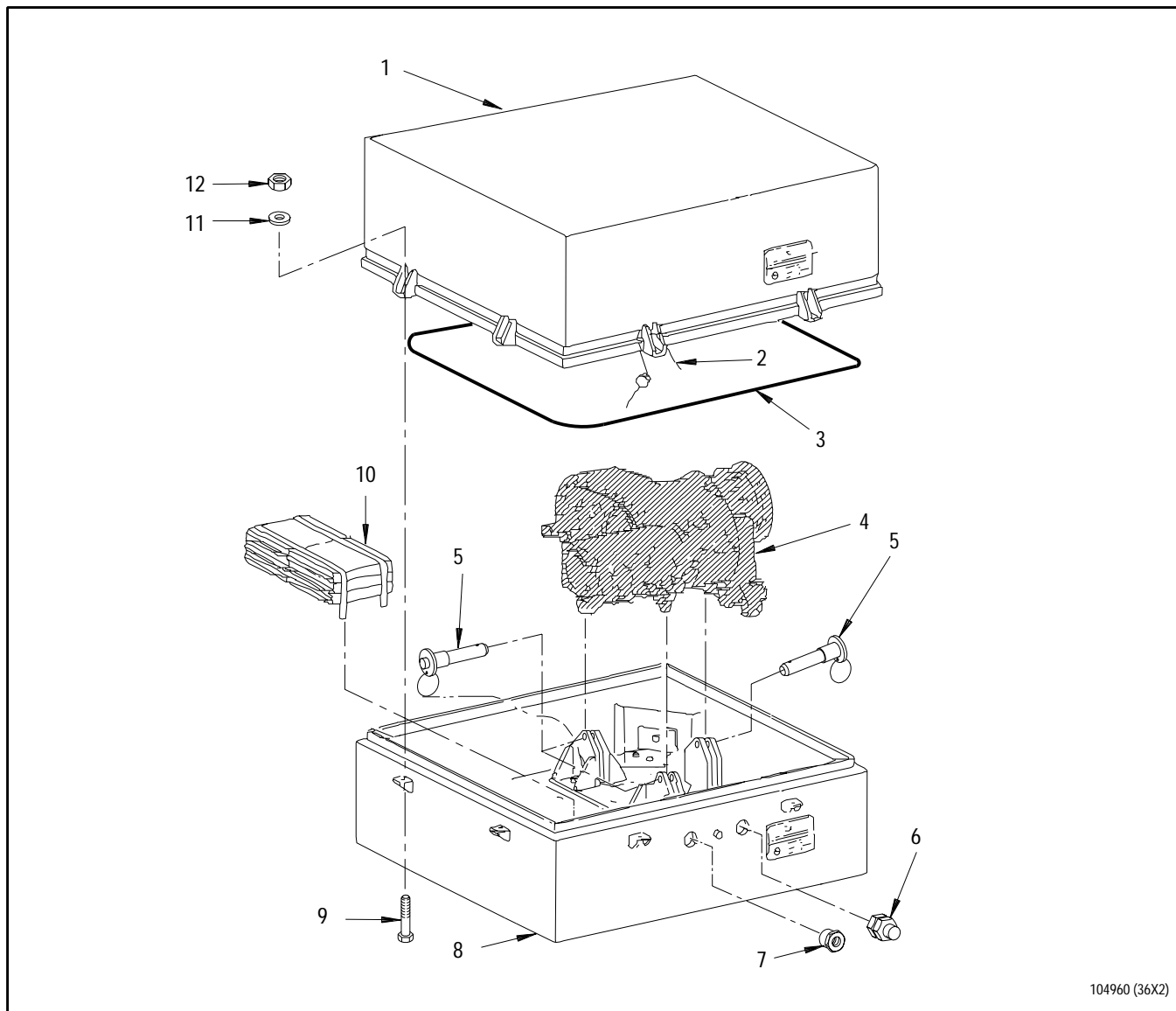
- e. Attach condition tag to gearbox module.



To prevent damage to humidity indicator, do not concentrate heat in one spot.

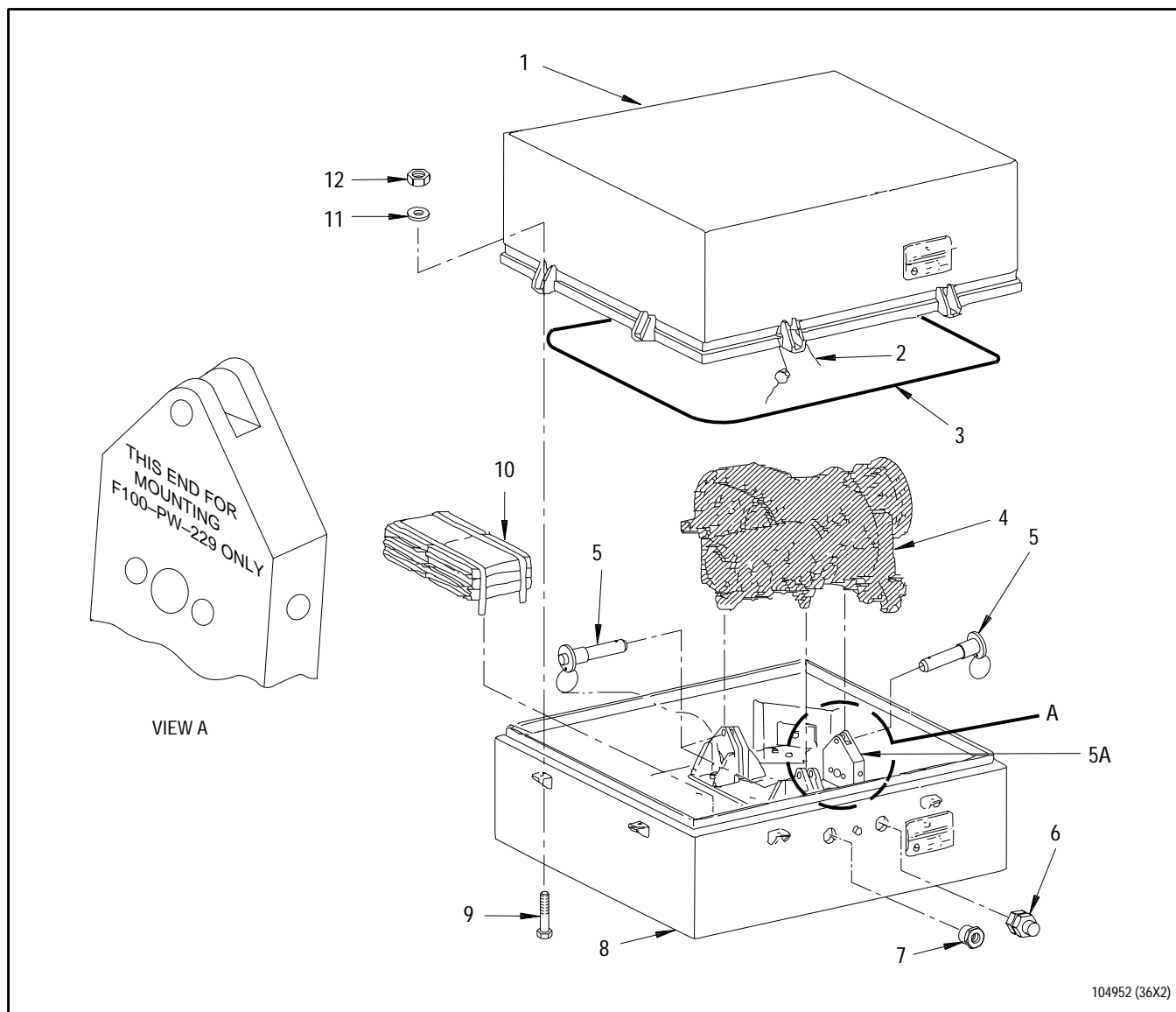
- f. Replace humidity indicator plug(7) or use the old one by drying it with a hand held dryer until its blue color is restored.
- g. Inspect interior of container(1 and 8) for cleanliness, remove any foreign objects. For container P4078971 (figure 2), verify dual mounting bracket (5A) is positioned for F100-PW-229 gearbox.
- h. Place six bags of desiccant(10) on wooden support in container and tape to secure with pressure sensitive tape.
- i. Lower gearbox module onto container angle bracket and install three quick-release pins(5).

- j. Release handling fixture from gearbox module by loosening hand knobs which secure fixture support clamp. Remove fixture.
- k. Inspect interior of container(1 and 8) for cleanliness, remove any foreign objects, and check gearbox for security.
- l. Place one set of all shipping paperwork in container.
- m. Whenever container marking is required, identify module information on outside of container in one-half or one inch high letters, whichever is appropriate for container use.
- n. Install top(1). Secure with bolts(9), lockwashers(11), and hexnuts(12). Torque bolts(9) 250 to 270 pound-inches. Secure with lockwire with lead seals(2) located at any two places diagonally opposite each other.
- o. Tighten pressure relief valve(6).



- |  |                            |
|--|----------------------------|
| 1. Container top                       | 7. Humidity indicator plug |
| 2. Lockwire with lead seal             | 8. Container base          |
| 3. Packing                             | 9. Bolt                    |
| 4. Gearbox module                      | 10. Desiccant and tape     |
| 5. Quick-release pin, (three required) | 11. Lockwasher             |
| 6. Air pressure relief valve           | 12. Hex nut                |

**Figure 1. P4070543 Gearbox Module Shipping Container**



104952 (36X2)

- |  |                            |
|--|----------------------------|
| 1. Container top                       | 7. Humidity indicator plug |
| 2. Lockwire with lead seal             | 8. Container base          |
| 3. Packing                             | 9. Bolt                    |
| 4. Gearbox module                      | 10. Desiccant and tape     |
| 5. Quick-release pin, (three required) | 11. Lockwasher             |
| 5A. Dual mounting bracket              | 12. Hex nut                |
| 6. Air pressure relief valve           |                            |

**Figure 2. P4078971 Gearbox Module Shipping Container**





# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARBOX MODULE - PRESERVATION

EFFECTIVITY: ENGINE MODEL F100-PW-229

#### LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 5 . . . . .		6			
6 . . . . .		0			

**REFERENCE MATERIAL REQUIRED**

<b>Title</b>	<b>Number</b>
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Gearbox Module - Disassembly into Subassemblies - - - -	WP 011 00
Gearbox, Final Assembly of External Parts and Pressure Check - - - - -	WP 705 00

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

<b>Nomenclature</b>	<b>Specification/Vendor Part Number</b>
Oil, lubricating	MIL-L-7808
Tape, masking (PMC 4001-2)	PPP-T-97, Type III, 1/2 inch wide, color red

**EXPENDABLE ITEMS**

<b>Nomenclature</b>	<b>Part Number</b>	<b>Quantity</b>
Plastic Closure	P12772	2
Cap	P42381	1
Cap	P4021568-01	2
Cap	P4021568-03	1
Cover	P61218	1
	or	
	P53007	
Plastic Barrier	P11040	3
Plastic Closure	P10550	2
Plastic Closure	P12768	1
Plastic Closure	P12772	1
Plastic Closure	P12777	1
Plastic Closure	P14592	1
Plastic Closure	P31102	1
Plastic Closure	P31108	1
Plug	P6616-A	1
Plug	P4021572-01	2

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

**1. INTRODUCTION.**

- a. This work package contains instructions for the preservation of the gearbox module.

**2. GEARBOX MODULE - PRESERVATION.**

(See Figure 1.)

**NOTE**

If gearbox module or main gearbox assembly has been stored for seven days or more or has been contaminated by fuel or water, it shall be preserved prior to shipment and the oil filter shall be removed for shipment; otherwise, cap all openings.

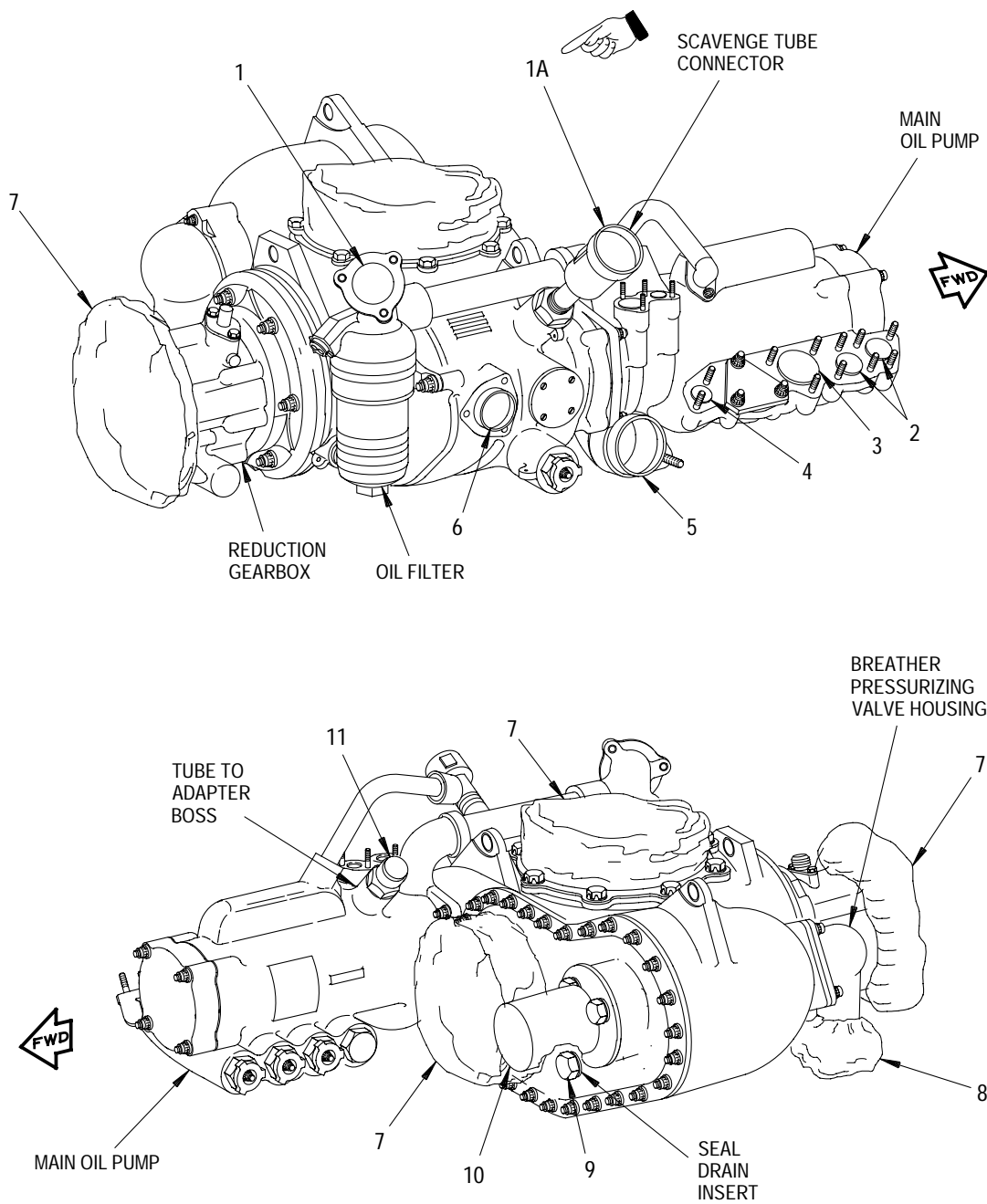
- a. Cap all openings with exception of breather pressurizing valve opening as follows:

- (1) Cover oil inlet and oil scavenge openings on right side of main oil pump with plastic closures(2, 3, 4, and 5, figure 1, sheet 1).
- (2) Install cap(6) to triangular pad next to company emblem.
- (3) Install plastic closure(1) on oil filter flange.
- (4) Install plastic closure(1A) on scavenge tube connector.
- (5) Install cap(13, figure 1, sheet 2) on tube adapter adjacent to breather pressurizing valve housing. Install plug(12) and cap(13) on tube adapters at reduction gearbox.



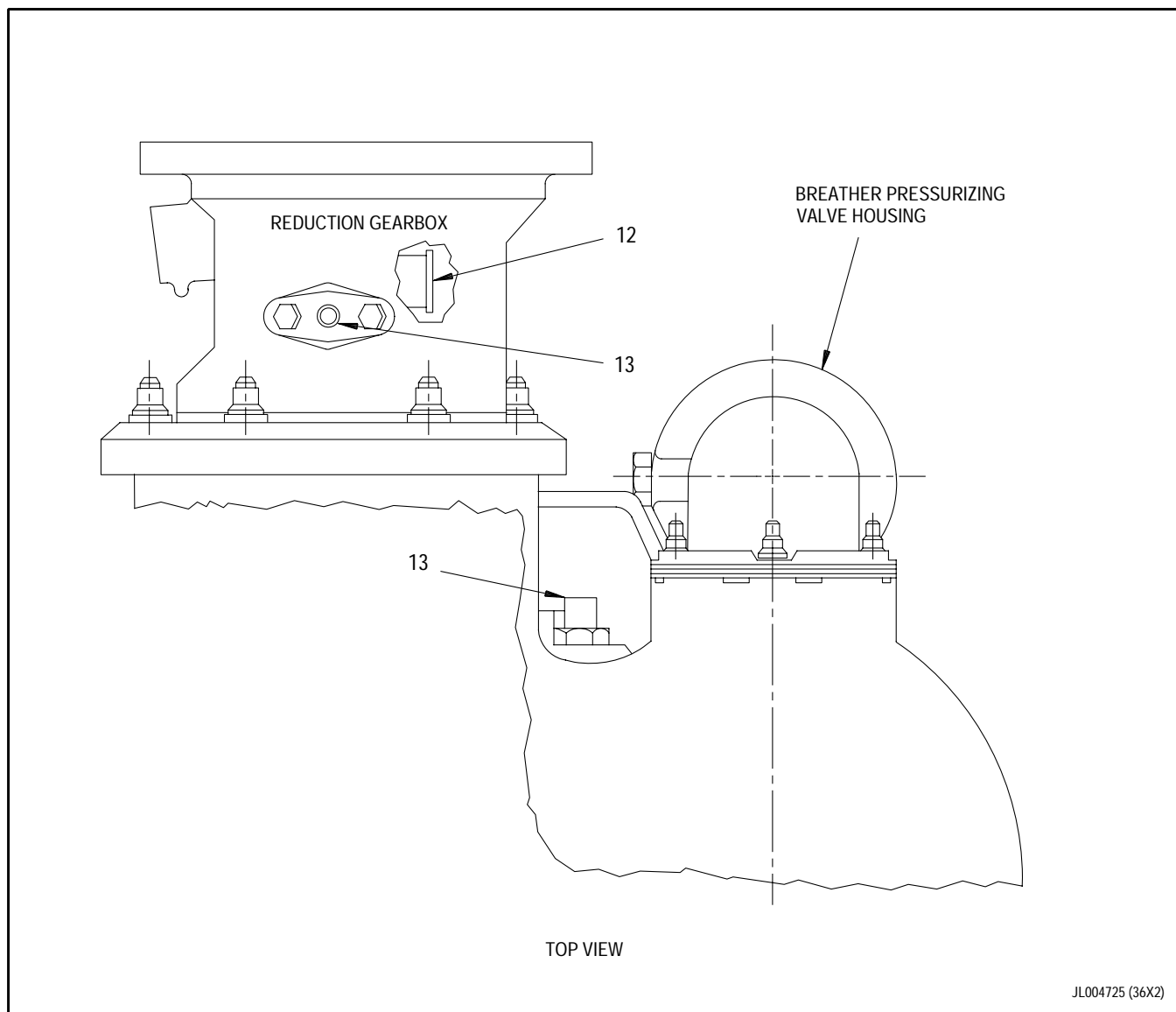
Do not allow tape to contact parts or allow tape residue to contaminate gearbox interior. Tape residue can cause blockage of oil jets.

- (6) Install plastic barrier(7, figure 1, sheet 1) on reduction gearbox flange. Secure with masking tape (PMC 4000-2).
- (7) Install plastic barrier(7) on sealing sleeve. Secure with masking tape (PMC 4000-2).
- (8) Install plastic barrier(7) on start drive pad. Secure with masking tape (PMC 4000-2).
- (9) Install cap(11) on tube to adapter boss at main oil pump.
- (10) Install plug(9) in fuel pump seal drain bushing.
- (11) Install cover(10) over gearbox deaerator impeller shaft. Secure cover with three PN MS9320-09 washers and PN MS9146-06 or PN MS9146-08 bolts.



JL004701 (48X2)

Figure 1. Gearbox Module - Shipping Caps Installation (Sheet 1 of 2)



1. Plastic closure (PN P12772)
- 1A. Plastic closure (PN P12768)
2. Plastic closure (PN P10550)
3. Plastic closure (PN P31108)
4. Plastic closure (PN P31102)
5. Plastic closure (PN P12777)
6. Cap (PN P42381)
7. Plastic barrier (PN P11040)
8. Plastic closure (PN PN P14592)
9. Plug (PN P4021572-01)
10. Cover (PN P61218 or P53007)
11. Cap (PN P4021658-03)
12. Closure plug (PN P6616-A)
13. Closure cap (PN P4021568-01)

**Figure 1. Gearbox Module - Shipping Caps Installation (Sheet 2 of 2)**



Ensure No. 2 and 3 bearing scavenge pump is secured in place or is manually retained to prevent it from unseating.

- b. Position main gearbox so breather pressurizing valve opening is up.
- c. Fill main gearbox with MIL-L-7808 engine oil.
- d. Install plastic closure(8) on breather pressurizing valve housing and invert gearbox to oil all interior parts.

- e. Drain gearbox module by removing metal chip detector and check valve (No. 2 and 3 bearing compartment) per WP 011 00.
- f. Install No. 2 and 3 bearing compartment chip detector per WP 705 00.

### 3. FOLLOW-ON MAINTENANCE.

- a. Install gearbox module in shipping container per WP 005 00.

**WORK PACKAGE**

**INTRODUCTION**

**GEARBOX MODULE - DISASSEMBLY INTO SUBASSEMBLIES**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 2

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 2 . . . . .					
		9			

**1. INTRODUCTION.**

- a. This work package introduces the 010 00 through 019 00 series of work packages and subordinate work packages for disassembly of the gearbox module into subassemblies. The following work packages are included in this series.

<b>WP/SWP No.</b>	<b>Title</b>
011 00	Gearbox Module - Removal of Externally Accessible Accessories and Parts
012 00	Separation of (Front and Rear) Gearbox Housings
013 00	Gearbox (Front) Housing - Disassembly
014 00	Gearbox (Rear) Housing (Incorporating PTO Duplex Bearing with Split Inner Race) - Disassembly
014 01	Gearbox (Rear) Housing (Incorporating PTO Duplex Bearing with One Piece Inner Race) - Disassembly
015 00 through 019 00	Open



**WORK PACKAGE****TECHNICAL PROCEDURES****GEARBOX MODULE -****REMOVAL OF EXTERNALLY ACCESSIBLE ACCESSORIES AND PARTS****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 28

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 3 . . . . .	22	8 . . . . .	2	14D Blank Added . . . . .	22
4 . . . . .	21	9 - 12 . . . . .	0	15 . . . . .	22
4A Added . . . . .	21	13 . . . . .	22	16 - 17 . . . . .	0
4B . . . . .	22	14 . . . . .	11	18 . . . . .	20
5 . . . . .	22	14A - 14C Added . . . . .	22	19 . . . . .	21
6 - 7 . . . . .	14			20 - 22 . . . . .	0

## REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O.2-1-111
Lube Oil Filter, Overhaul Instructions - - - - -	T.O.7J2-27-3
Cleaning and Testing Instructions - Woven Wire Filter Elements, Overhaul Instructions - - - - -	T.O.9H3-1-1

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229(V)-501	01 JAN 95	O/I	Incorporation of 30 micron oil filter with full-flow bypass valve, F100-PW-229 Engines, F-15/F-16 Aircraft (ECP 90QA168C1)

## CONSUMABLE MATERIALS

None

## EXPENDABLE ITEMS

None

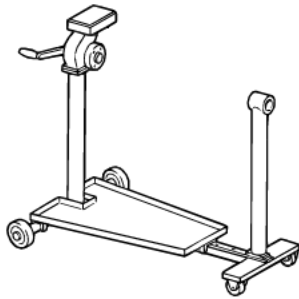
## APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	GEARBOX MODULE - INSTALLATION IN STAND	
	ADAPTER, HOLDING, MAIN GEARBOX BUILD AND TRANSMISSION STAND - - - - -	PWA 50473
	STAND, MAIN GEARBOX - - - - -	PWA 57412
		OR
	STAND, MAIN GEARBOX - - - - -	PWA 27606
	FIXTURE, HANDLING, MAIN GBX MODULE AND FUEL PUMP - -	PWA 56579
		OR
	FIXTURE, HANDLING, GEARBOX MODULE - - - - -	PWA 57071
	ADAPTER, HOLDING, GEARBOX BUILD AND TRANSPORTATION STAND - - - - -	PWA 57752
5	REMOTE GEARBOX DRIVESHAFT COUPLING - REMOVAL	
	REMOTE GEARBOX DRIVESHAFT COUPLING, REMOVAL - - - - -	
	ADAPTER, TORQUE, REMOTE GEARBOX DRIVE COUPLING BOLT	PWA 57388
7A	OIL FILTER - TORQUING LOOSE COMPONENTS IN FILTER HEAD ASSEMBLY	
	ADAPTER, TORQUE, OIL FILTER SHUTOFF VALVE - - - - -	PWA 56801
10	NO. 2 AND 3 BEARING (GEARBOX) SCAVENGE PUMP - REMOVAL	
	NO.2 AND 3 BEARING GEARBOX SCAVENGE PUMP, REMOVAL - -	
	HOLDER, GEARBOX SCAVENGE PUMP TO GEARBOX - - - - -	PWA 50482

## APPLICABLE SUPPORT EQUIPMENT (continued)

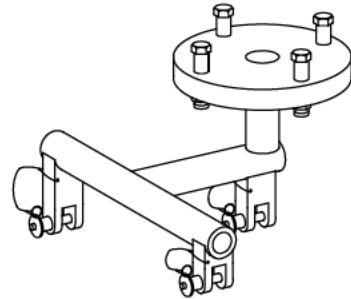
Paragraph	Function - Tool Nomenclature	Tool Number
11	GEARSHAFT SEALS - REMOVAL	
	PULLER, MAIN GEARBOX PTO SHAFT, SEAL, RETAINER - - -	PWA 56752
		OR
	PULLER, MAIN GEARBOX ASSY, PTO DRIVESHAFT BAFFLE, SEAL & IMPELLER - - - - -	PWA 56317
	PULLER, DRIVESHAFT BAFFLE - - - - -	PWA 50666
	PULLER, MAIN GEARBOX PTO SHAFT, SEAL, RETAINER - - -	PWA 56752
		OR
	PULLER, MAIN GEARBOX ASSY, PTO DRIVESHAFT BAFFLE, SEAL & IMPELLER - - - - -	PWA 56317
		OR
	PULLER, DRIVESHAFT SEAL - - - - -	PWA 50510
	PULLER, MAIN GEARBOX PTO SHAFT, SEAL, RETAINER - - -	PWA 56752
		OR
	PULLER, MAIN GEARBOX ASSY, PTO DRIVESHAFT BAFFLE, SEAL & IMPELLER - - - - -	PWA 56317
		OR
	PULLER, DEAERATOR IMPELLER SHAFT SEAL - - - - -	PWA 50511

ILLUSTRATED SUPPORT EQUIPMENT



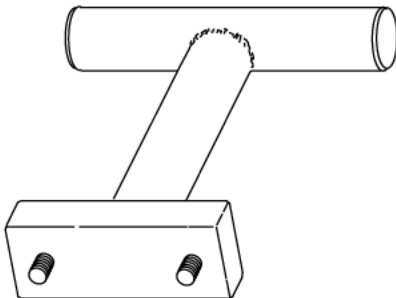
PWA 27606 -C

Figure T1. PWA 27606 STAND



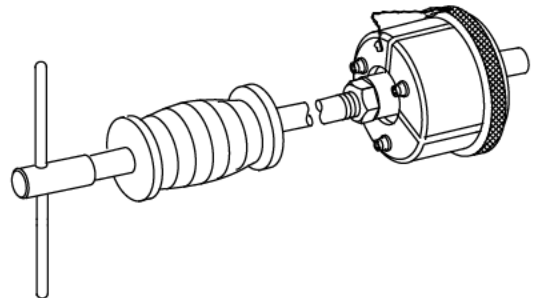
PWA 50473 -C

Figure T2. PWA 50473 ADAPTER



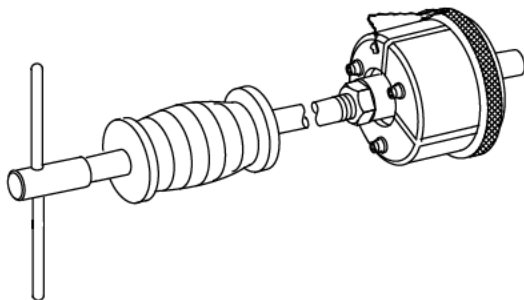
PWA 50482 -C

Figure T3. PWA 50482 HOLDER



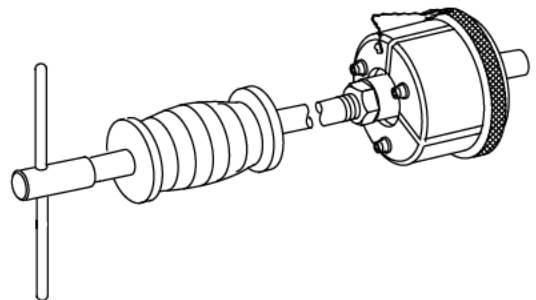
PWA 50510 -C

Figure T4. PWA 50510 PULLER



PWA 50511 -C

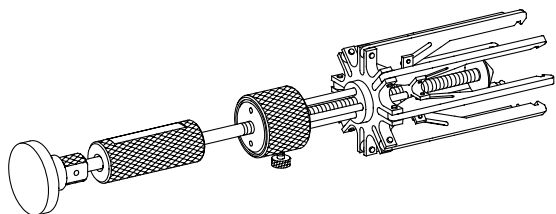
Figure T5. PWA 50511 PULLER



PWA 50666 -C

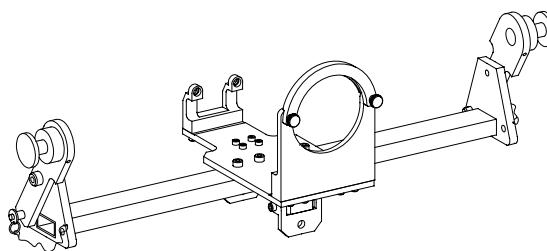
Figure T6. PWA 50666 PULLER

ILLUSTRATED SUPPORT EQUIPMENT (continued)



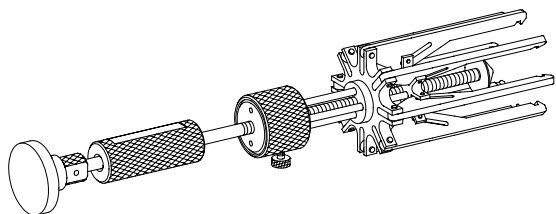
PWA 56317 -C

Figure T7. PWA 56317 PULLER



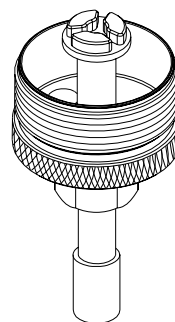
PWA 56579 -C

Figure T8. PWA 56579 FIXTURE



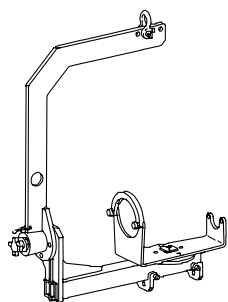
PWA 56752 -C

Figure T9. PWA 56752 PULLER



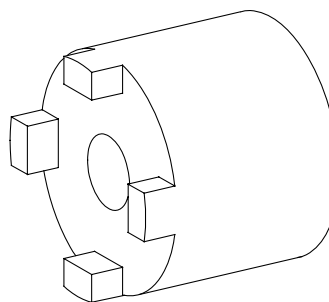
PWA 56801 -C

Figure T10. PWA 56801 ADAPTER



PWA 57071 -C

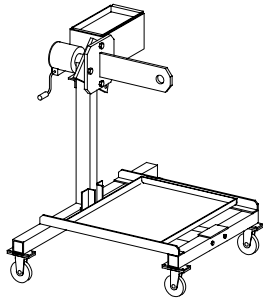
Figure T11. PWA 57071 FIXTURE



PWA 57388 -C

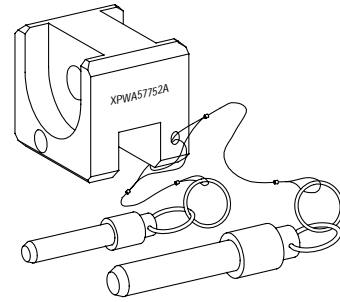
Figure T12. PWA 57388 ADAPTER

**ILLUSTRATED SUPPORT EQUIPMENT (continued)**



PWA 57412 -C

**Figure T13. PWA 57412 STAND**



PWA 57752 -C

**Figure T14. PWA 57752 ADAPTER**

## 1. INTRODUCTION.

- a. This work package contains instructions for the following:

- (1) Installation of gearbox module in stand.
- (2) Removal of breather pressurizing valve, remote gearbox driveshaft coupling, reduction gearbox assembly, oil filter, main (oil) pump, No. 2 and No. 3 bearing (gearbox) scavenge pump, gearshaft seals, and various connectors, adapters, bushings, and inserts, all externally accessible without separating front and rear gearbox housings.

## 2. GEARBOX MODULE - INSTALLATION IN STAND.

(See Figure 1.)

- a. Remove mounting links and brackets from gearbox if not already removed.
- b. Install PWA 50473 adapter(2, figure 1) to PWA 57412 stand(3).

### NOTE

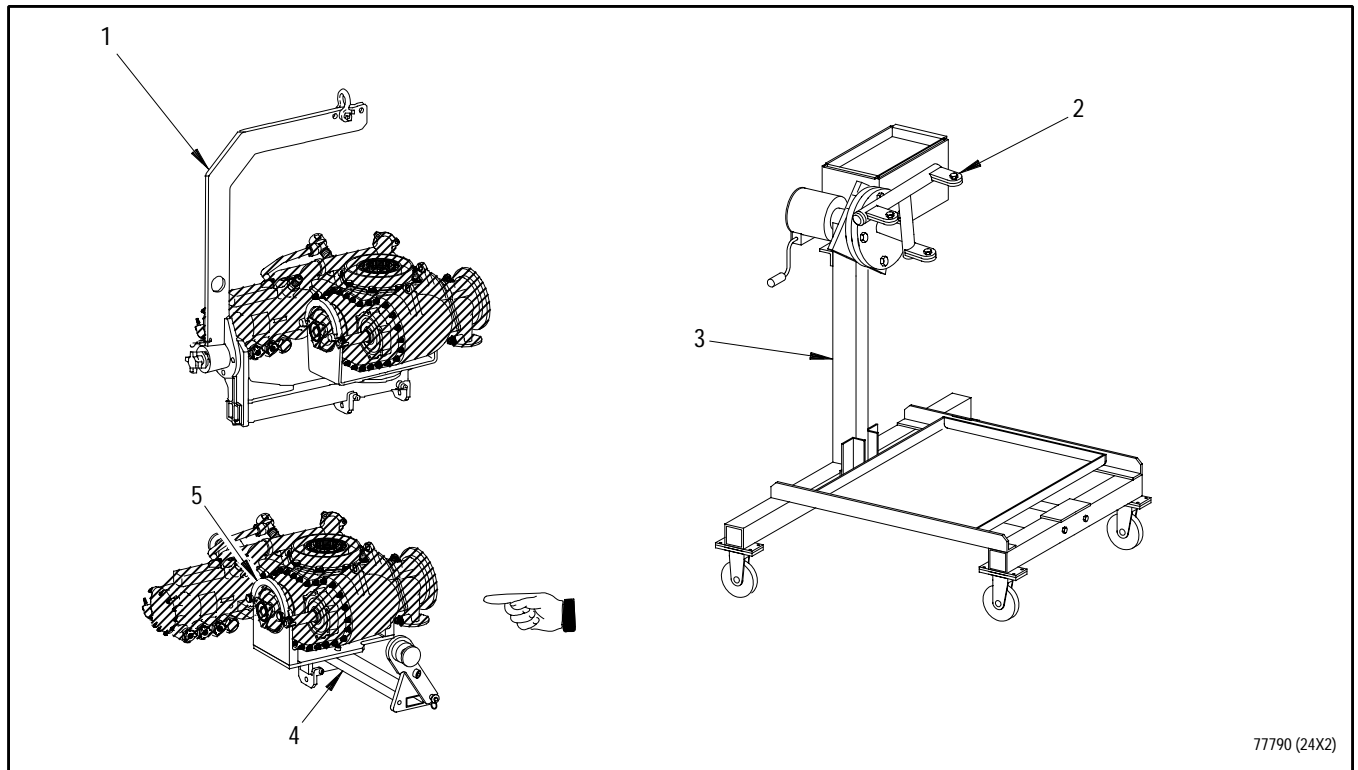
For PWA 56579 handling fixture, refer to step c. For PWA 57071 handling fixture, refer to step d.

- c. Attach PWA 56579 handling fixture on gearbox module as follows:
  - (1) Remove support clamp(5) from PWA 56579 fixture(4) prior to installation.
  - (2) Position two retainer lugs over two nuts securing reduction gearbox assembly to main gearbox housing.

Tilt fixture slightly to slip over nuts.

- (3) Install opposite end of tool into PTO housing groove. Reinstall support clamp and secure hand knobs.
- (4) Adjust trunion arms as required to optimize center of gravity.
- d. Attach PWA 57071 handling fixture on gearbox module as follows:
  - (1) Align PWA 57071 fixture(1) bracket holes with reduction gearbox drive pad nuts. Attach fixture support clamp to main gearbox at grooved boss of starter drive pad. Secure with two hand knobs.
  - (2) Attach separable overhead handling arm to fixture by sliding arm on fixture pivot journal and securing with ball lock pin.
- e. Attach hoist to PWA 56579 trunions or PWA 57071 handling arm and carefully lift module. Position and secure module to stand by fitting housing lugs into clevises of stand adapter and locking in place with ball lock pins.
- f. Install PWA 57752 adapter at rear lug location on PWA 50473 adapter.
- g. Position forward lugs of module into clevises of PWA 50473 adapter and rear lug of module into clevis of PWA 57752 adapter and secure with ball lock pins.
- h. Remove hoist and handling fixture.





77790 (24X2)

1. PWA 57071 handling fixture
2. PWA 50473 adapter
3. PWA 57412 stand
4. PWA 56579 handling fixture
5. Support clamp

**Figure 1. Gearbox Handling Tools**

### 3. BREATHER PRESSURIZING VALVE ASSEMBLY - REMOVAL.

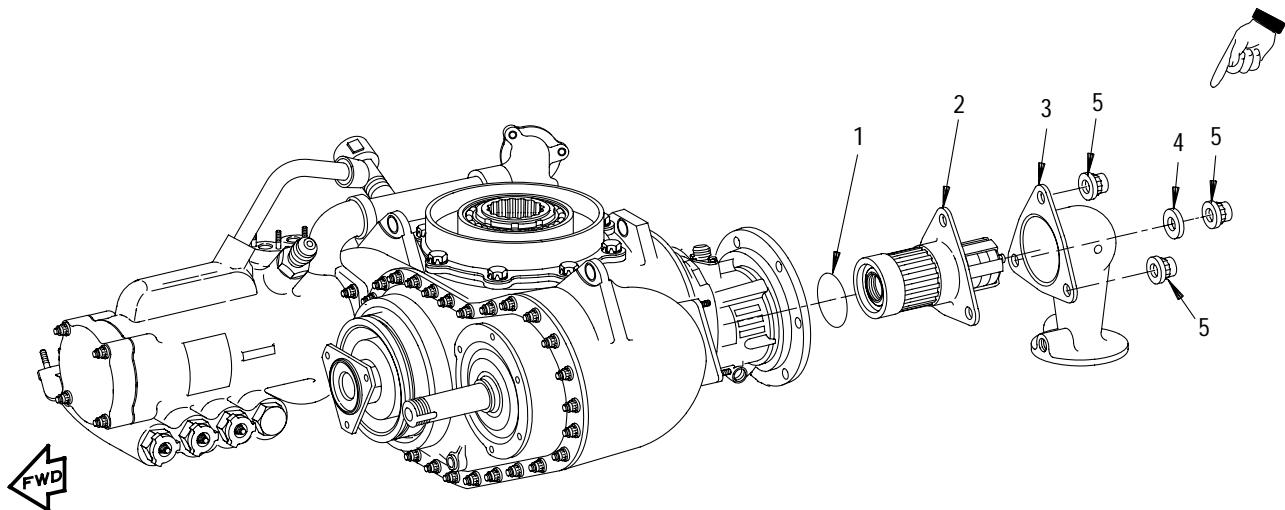
(See Figure 2.)



Remove valve assembly by hand only. Use of tools to pry valve loose will damage mounting surface.

- a. Remove nuts(5) and washer(4) securing breather pressurizing valve(2) and housing(3) to gearbox. Discard washer.
- b. Remove housing and valve from gearbox. Discard packing(1).

1. PACKING
2. BREATHER PRESSURIZING VALVE
3. HOUSING
4. WASHER
5. NUT



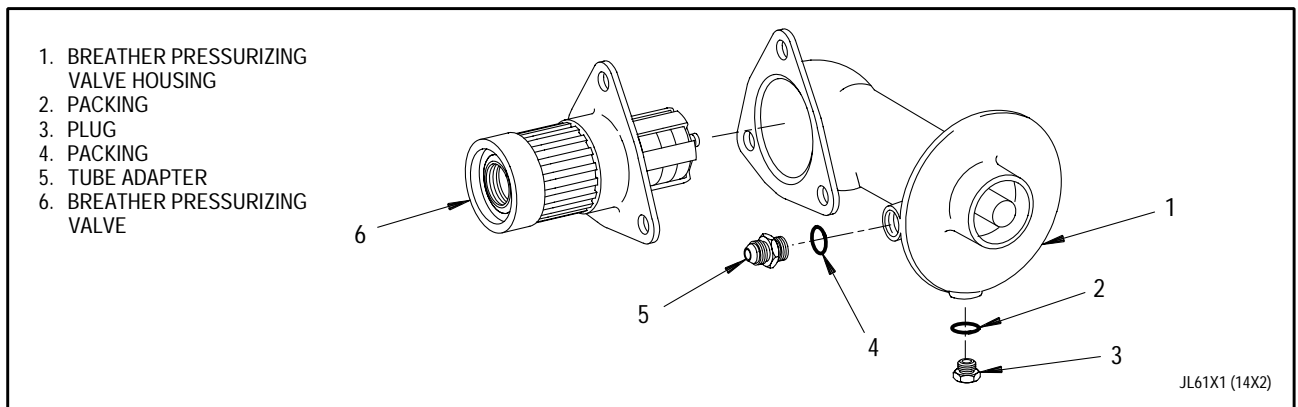
15624 (36X2)

Figure 2. Breather Pressurizing Valve Assembly - Removal

#### 4. BREATHER PRESSURIZING VALVE ASSEMBLY - REMOVAL OF ATTACHING PARTS.

(See Figure 3.)

- a. Remove tube adapter(5,  
figure 3), plug(3), packings(2  
and 4) and breather pressurizing  
valve(6) from valve housing.  
Discard packings(2 and 4).  
Place protective cover over  
breather pressurizing valve  
housing(1).



**Figure 3. Breather Pressurizing Valve Assembly - Removal of Attaching Parts**

## 5. REMOTE GEARBOX DRIVESHAFT COUPLING - REMOVAL.

(See Figures 4 and 5.)

- a. Remove remote gearbox driveshaft coupling by bending tabs of key washer(2, figure 4).

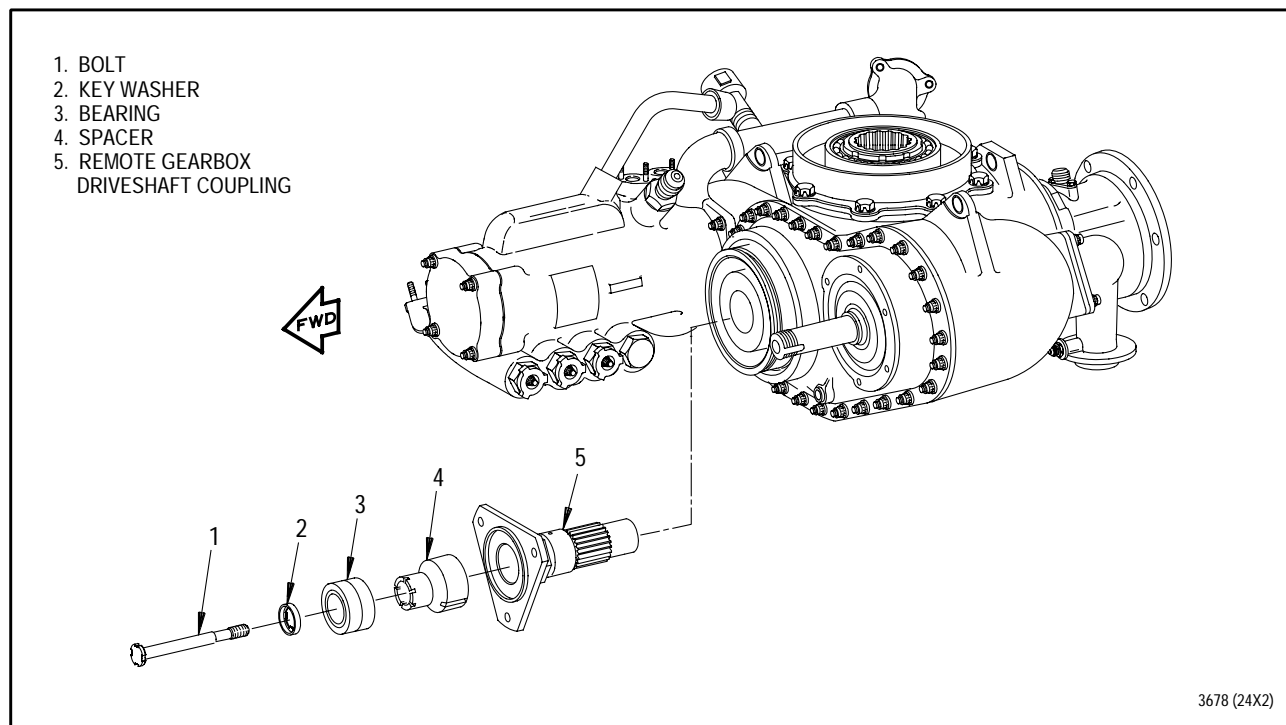


Figure 4. Remote Gearbox Driveshaft Coupling - Removal

- b. Loosen bolt(1) using PWA 57388 torque adapter.
- c. Remove bolt(1) and key washer(2). Discard key washer.
- d. Remove remote gearbox driveshaft coupling(5) from gearbox drive spline on gearbox spur bevel gearshaft.
- e. Remove bearing(3) and spacer(4) from coupling(5).

## 6. REDUCTION GEARBOX ASSEMBLY - REMOVAL.

(See Figure 6.)

- a. Remove nuts(4, figure 6) and washers(3) securing reduction gearbox assembly(2) to gearbox. Discard packing(1).
- b. Place protective cover on gearbox, and on reduction gearbox assembly.

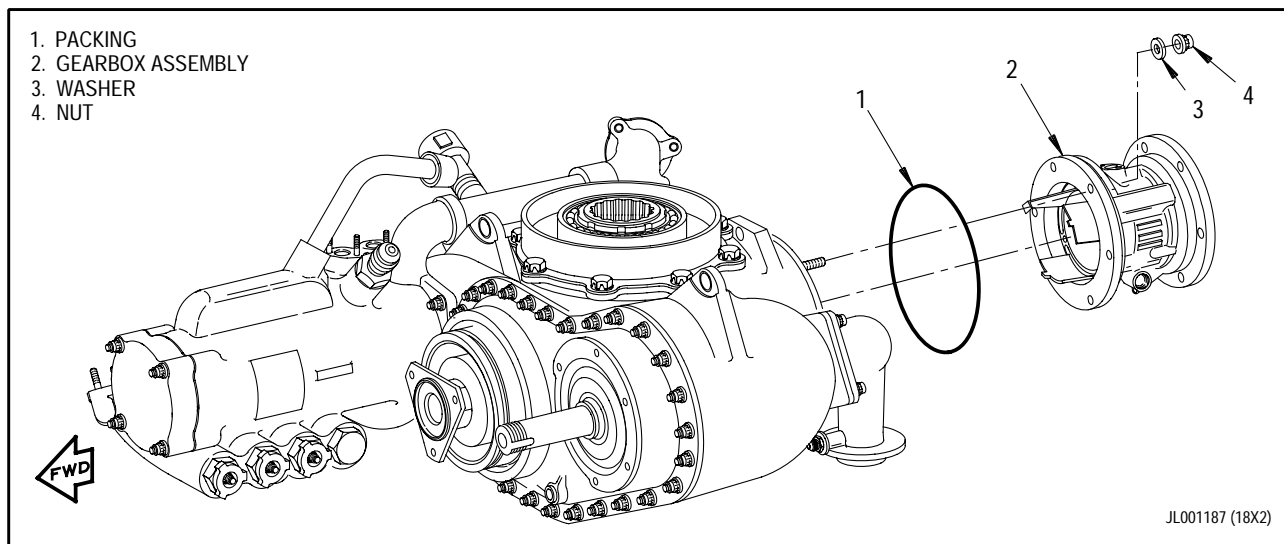


Figure 6. Reduction Gearbox Assembly - Removal

**7. OIL FILTER - REMOVAL.**

(See Figure 7.)

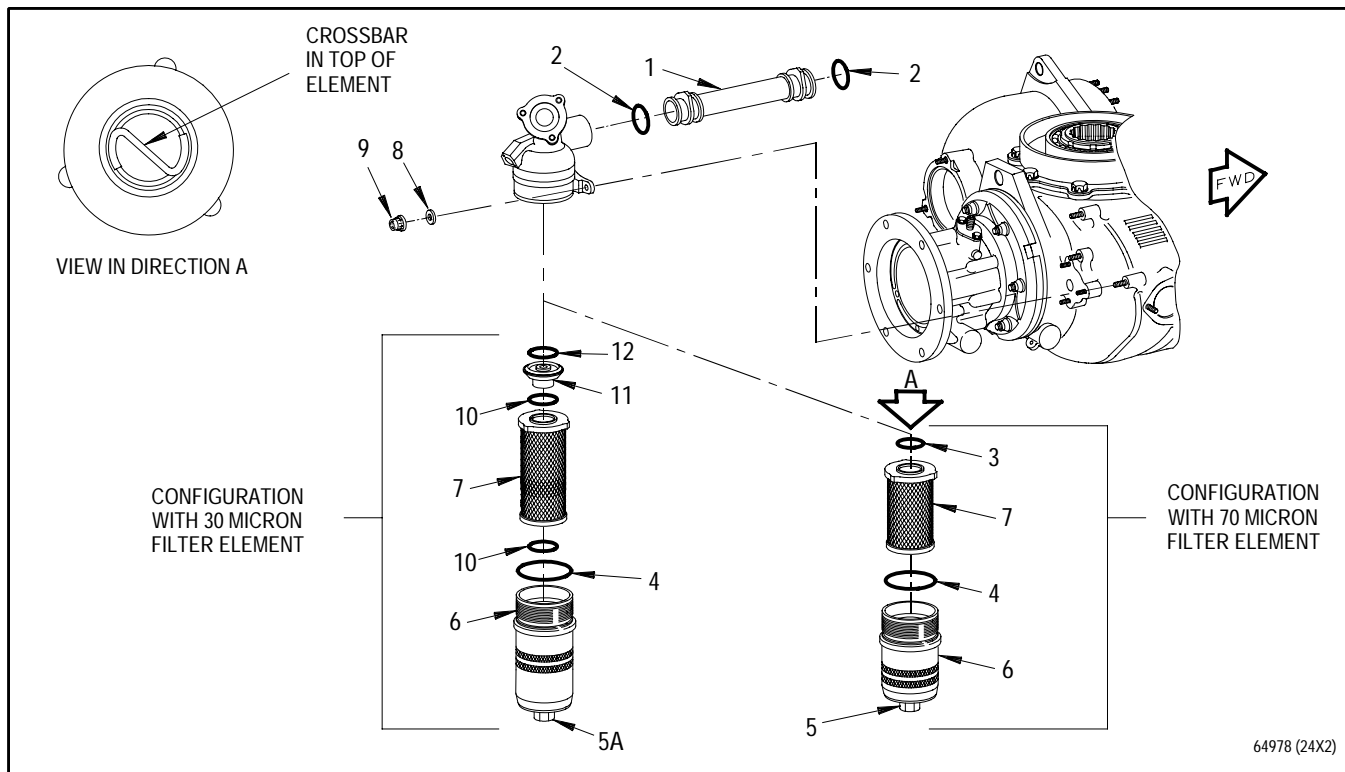
**WARNING**

Filter bowl is under spring tension. Internal parts may be forcefully propelled during removal. Use caution when removing filter bowl to prevent injury.

**NOTE**

There are two configurations of oil filter assemblies. A 70 micron filter that has a cleanable element or a 30 micron filter that has a disposable filter element and bypass valve with an actual bypass indicator located in filter bowl bottom.

- a. Unthread oil filter bowl(6, figure 7) from filter head assembly, taking care to prevent loss of particles in filter or bowl
- a1. Remove oil filter bowl using hex head(5 or 5A) on filter bowl. Drain any residual oil into containers. Remove filter element(7). Discard packings(3 or 10, and 4).
- a2. Visually inspect filter head internal components for looseness. If loose, torque per paragraph 7A.
- a3. Remove bypass valve assembly(11) from oil filter housing of 30 micron configuration oil filter. Discard packing(12).
- b. Inspect filter element(7) and bowl(6) for foreign material.
- c. Inspect filter element(7) for distortion or dents that would cause it to fit improperly into filter assembly bowl(6) and housing, or cause oil leakage past packings(3 or 10) that mate with element. Replace filter element if defected or disposable 30 micron type.
- d. Inspect filter element(7) for loose or missing Z insert. Replace filter element if Z insert is loose or missing.
- e. Remove nuts(9) and washer(8) securing oil filter to gearbox module and remove filter.
- f. Remove oil pump to oil filter transfer tube(1). Discard packings(2).
- g. Install protective cover.
- h. Refer to T.O. 7J2-27-3 for oil filter assembly overhaul instructions, if required.
- i. Refer to T.O. 9H3-1-1 for filter element cleaning instructions, if required.



**Figure 7. Oil Filter - Removal**



**7A. OIL FILTER - TORQUING LOOSE COMPONENTS IN FILTER HEAD ASSEMBLY.**

(See Figure 7A)



Differential pressure indicator consists of matched and permanently assembled details. Attempting disassembly may damage indicator.

- a. Remove differential pressure indicator(7) as follows:
  - (1) Remove screws(8) securing indicator(7) to filter head(1). Remove indicator(7).
  - (2) Remove retainer(5) and spring(6). Remove and discard packings(3 and 4).
  - (3) Place indicator(7) in clean plastic container.
- b. Loosen recessed lock screw(2) sufficiently to unlock nipple(16).
- c. Thread PWA 56801 torque adapter into filter housing until bottomed, then thread 1/2 turn more to relieve pressure of springs(11 and 12) on nipple and shutoff diaphragm(13).
- d. Push and rotate tool shaft(19) to engage cloverleaf assembly(18) in nipple(16).

**WARNING**

Nipple is spring loaded. Failure to maintain pressure during removal may cause components to spring out, causing personal injury and damage to components.

- e. Holding inward hand pressure on tool, slowly turn socket(20) counterclockwise to remove nipple(16) and associated components.

- f. Replace packings(9 and 17).
- g. Assemble filter head(1) as follows:
  - (1) Press fit shutoff spring(11) into spring retainer(10) if required.
  - (2) Press nipple(16) into shutoff diaphragm(13).
  - (3) Fill hole in poppet(14) with clean lubricating oil.
  - (4) Insert poppet stem(15) into poppet(14) and insert both into nipple(16).
  - (5) Lubricate threads on nipple(16) with clean lubricating oil.
  - (6) Place assembled shutoff diaphragm(13) over spring(12).
  - (7) Place all components on PWA 56801 torque adapter, engaging cloverleaf assembly(18) in nipple(16).
  - (8) Push assembled adapter into filter head(1) until threads engage housing.
  - (9) Thread until bottomed, then back off 1/4 to 1/2 turn.
- h. Torque to 180 inch-pounds.
- i. Remove torque adapter.
- j. Tighten recessed lock screw(2) and torque 12 to 16 inch-pounds.
- k. Install differential pressure indicator(7) per T.O. 7J2-27-3.

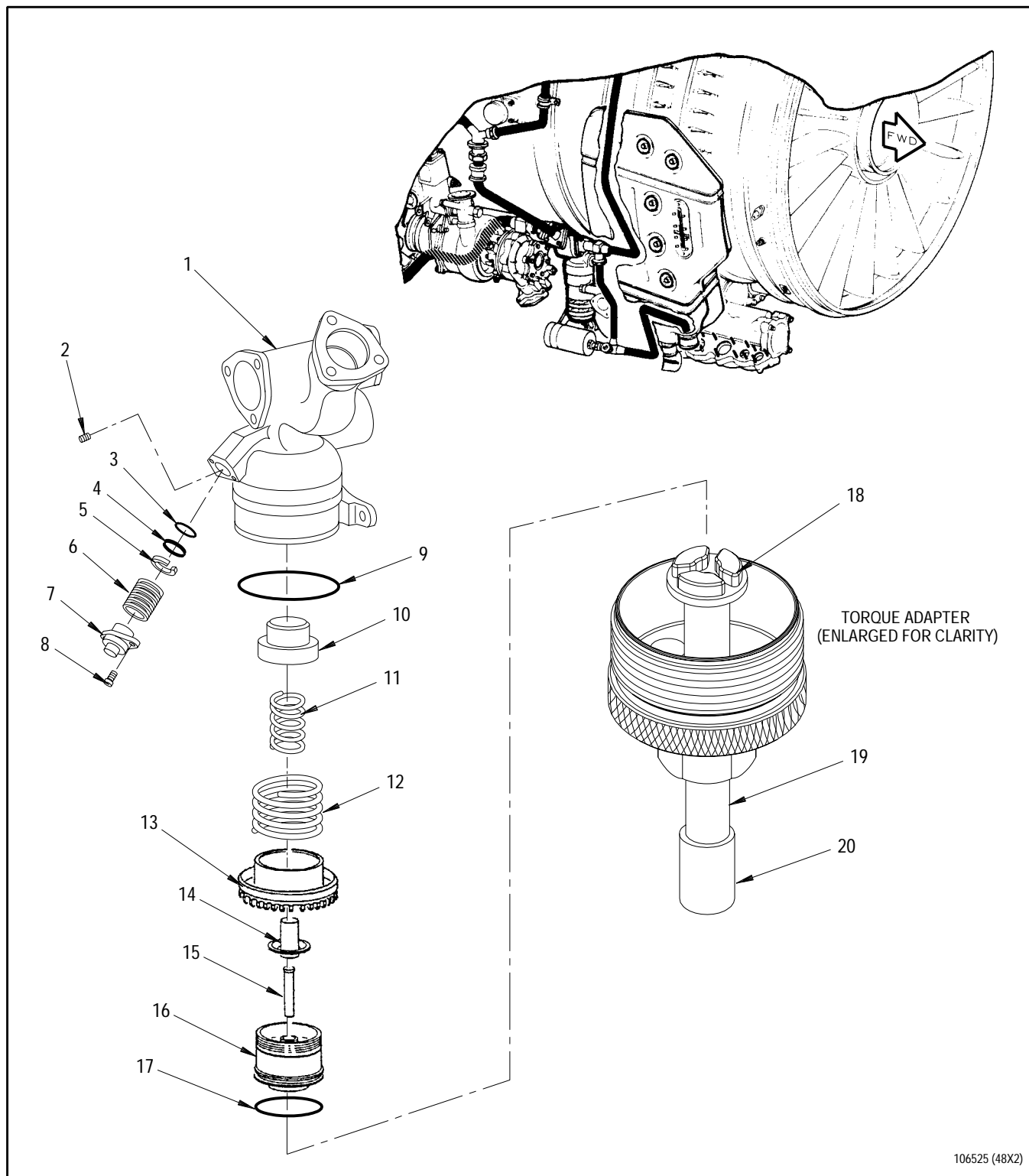


Figure 7A. Oil Filter - Torquing Loose Components in Filter Head Assembly

**Legend for figure 7A**

1. Filter head
2. Recessed lock screw
3. Packing
4. Packing
5. Retainer
6. Spring
7. Differential pressure indicator
8. Screw
9. Packing
10. Spring retainer
11. Shutoff spring
12. Spring
13. Shutoff diaphragm
14. Poppet
15. Poppet stem
16. Nipple
17. Packing
18. Cloverleaf assembly
19. Shaft
20. Socket



## 8. MAIN OIL PUMP IDLER BEARING PRESSURE TUBE - REMOVAL.

(See Figure 8.)

- a. Remove bolt, nut, and loop clamp securing pressure tube to bracket. (See figure 8.)

- b. Loosen tube nuts and remove pressure tube.

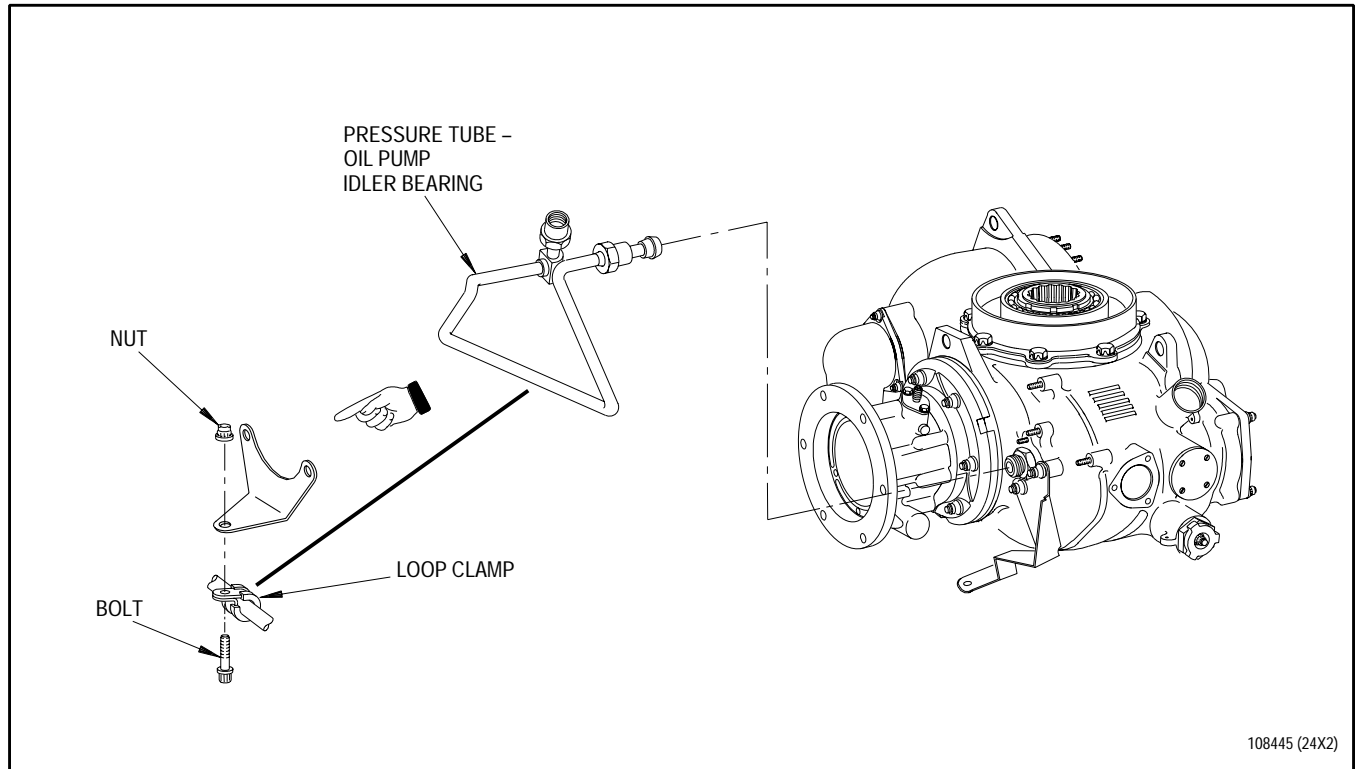


Figure 8. Main Oil Pump Idler Bearing Pressure Tube - Removal

**9. MAIN OIL PUMP - REMOVAL.**

(See Figure 9.)

- a. Position gearbox housing with main oil pump up.
- b. Remove nuts(8, figure 9) and flat washers(7) securing cover(6) to end of pump(9). Remove cover. Discard gasket(5).

**NOTE**

Do not remove nuts and washers located on same surface as bolts(10).

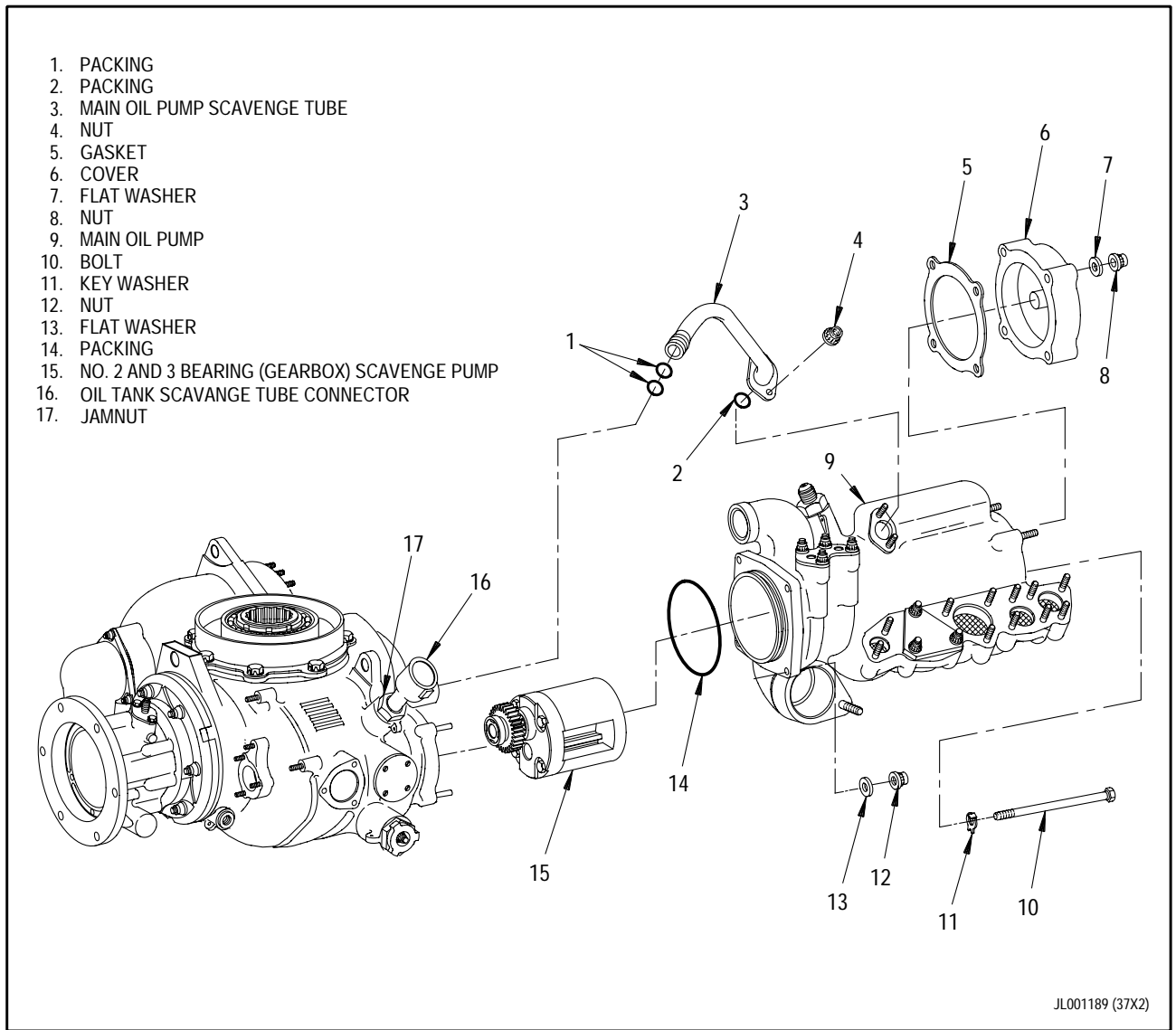
- c. Remove bolts(10) and key washers(11). Discard key washers.

- d. Remove tube(3) as follows:

- (1) Remove nuts(4).
- (2) Loosen jamnut(17) on scavenger tube connector(16).
- (3) Remove tube(3).
- (4) Remove and discard packings(1 and 2).

- e. Remove oil pump by removing nuts(12) and washers(13) securing pump to gearbox housing. Remove and discard packing(14).

- f. Plug or cap all openings.



**Figure 9. Main Oil Pump and Scavenge Pump - Removal**

**10. NO. 2 AND 3 BEARING (GEARBOX)  
SCAVENGE PUMP - REMOVAL.**

(See figure 9.)

- a. Use tool detail bolts to fasten PWA 50482 holder to scavenge pump(15, figure 9).
- b. Pull scavenge pump up until it is released from mounting pin in gearbox housing.

**NOTE**

Directional references are from the front.

- c. Rotate pump(15) approximately 1/4 of full turn clockwise and pull pump from housing.
- d. Plug or cap all openings.



**11. GEARSHAFT SEALS - REMOVAL.**

(See Figure 10.)

a. Remove all gearshaft seals as follows.

(1) Remove pad covers if present.

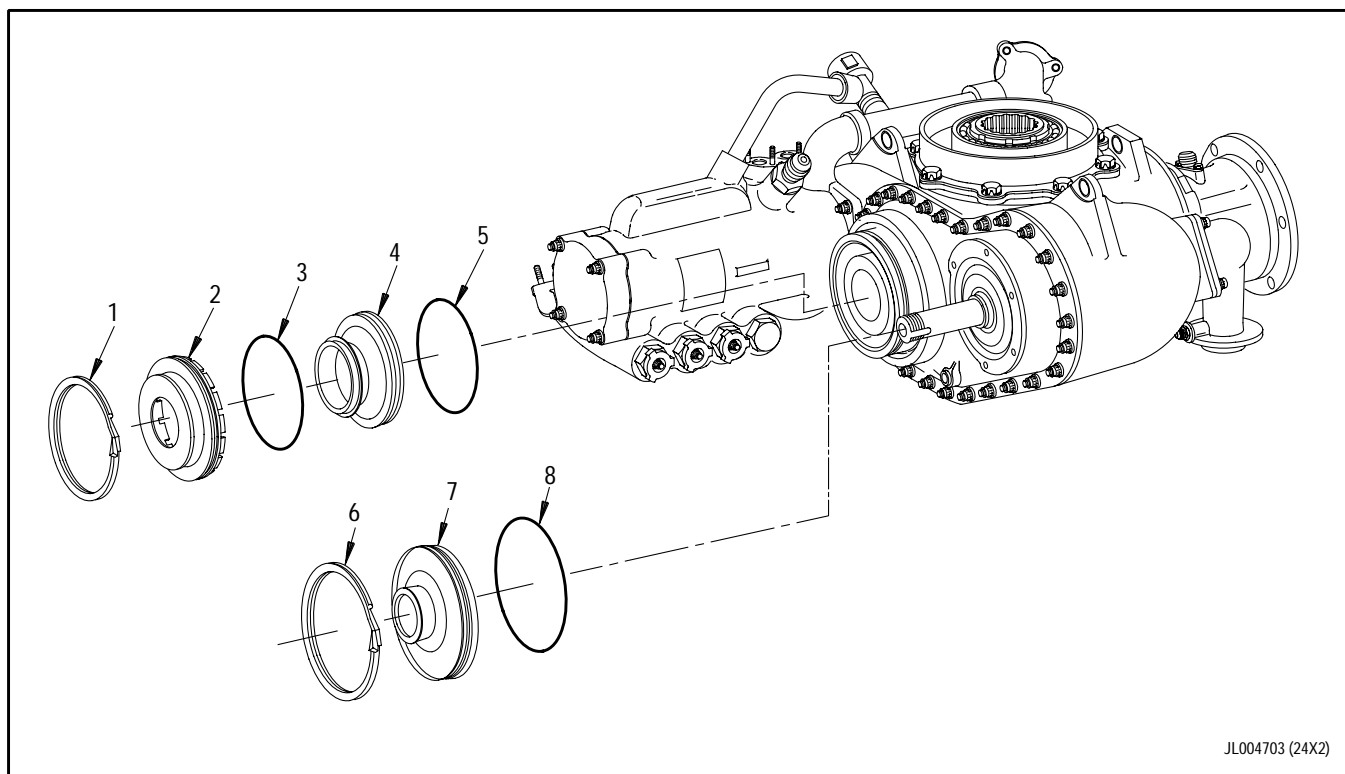
(2) Remove retaining rings(1, and 6, figure 10).

(3) Using PWA 56752 puller, remove gearbox packing cover(2). Remove and discard packing(3).

(4) Using PWA 56752 puller, remove oil seal retainer(4) by pulling straight out from housing. Remove and discard packing(5).

(5) Using PWA 56752 puller, remove oil seal retainer(7). Remove and discard packing(8).

(6) Store each oil seal retainer in a container. Refer to T.O. 2-1-111.



1. Retaining ring
2. Gearbox packing cover
3. Packing
4. Oil seal retainer
5. Packing
6. Retaining ring
7. Oil seal retainer
8. Packing

**Figure 10. Gearshaft Seals - Removal**

**12. GEARBOX EXTERNAL PARTS -  
REMOVAL.**

(See Figure 11.)

- a. Remove seal drain insert(1, figure 11). Remove and discard packing(2).
- b. Remove gearbox oil tank scavenge tube connector(8) from gearbox housing as follows:
  - (1) Loosen locknut(7) to release connector.
  - (2) Remove connector from boss on housing.
  - (3) Remove packing(5), and packing retainer(6). Remove packing from retainer and discard packing.
  - (4) Remove locknut(7) from connector(8).
- c. Remove adapter(4) located next to breather valve mount pad. Remove and discard packing(3).
- d. Remove metal chip detector(12) from its mating fluid check valve(10) by pushing in on knurled knob of chip detector and turning knob to left. Remove fluid check valve(10) from gearbox housing. Remove and discard packings(9 and 11).
- e. Plug or cap all openings.

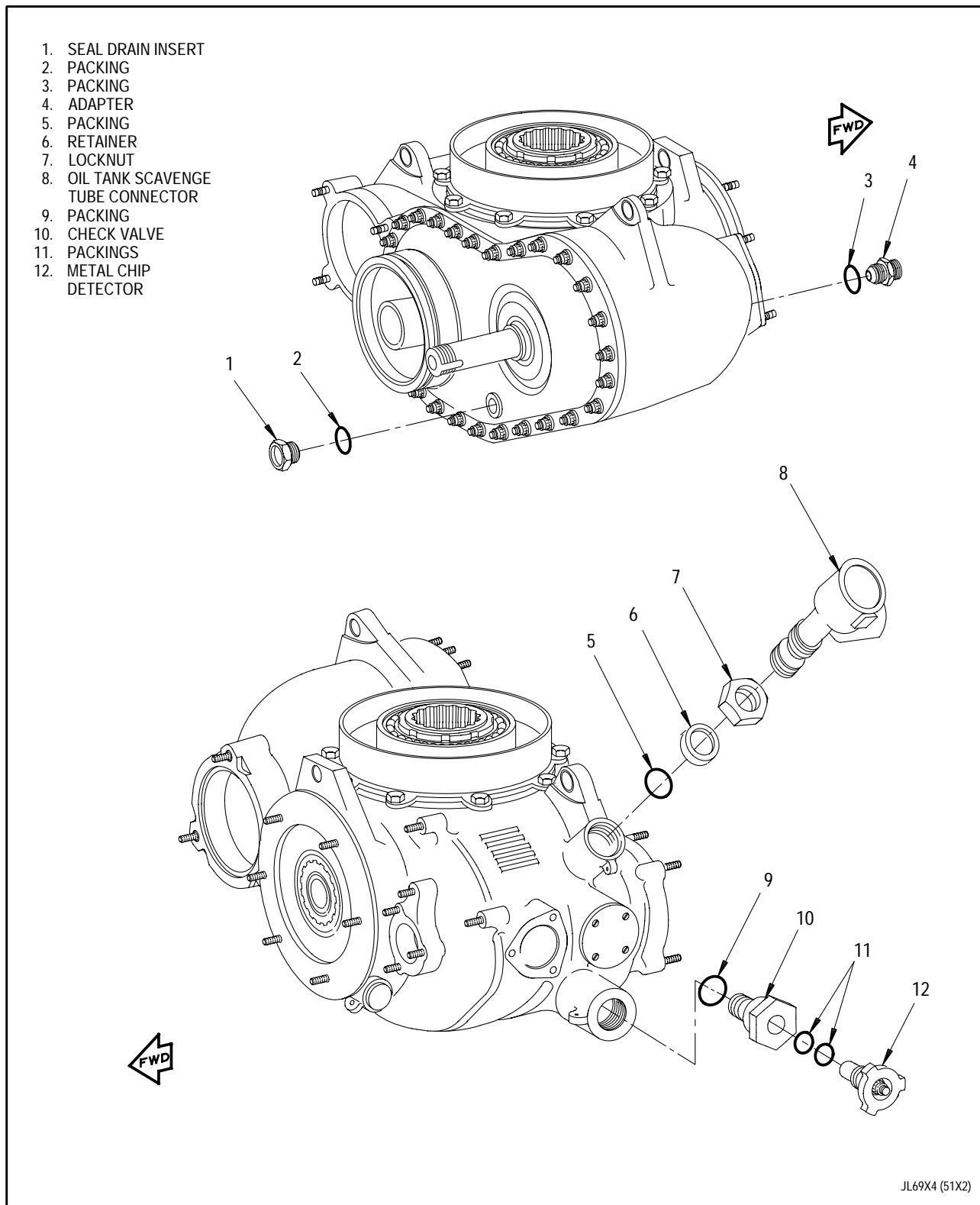


Figure 11. Gearbox External Parts - Removal

**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**SEPARATION OF (FRONT AND REAR) GEARBOX HOUSINGS**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 8

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 4 . . . . .	17	5 - 7 . . . . .	0	8 . . . . .	9

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O. 2-1-111

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
OIL, LUBRICATING	MIL-L-7808

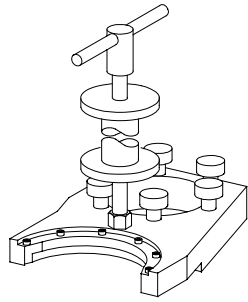
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

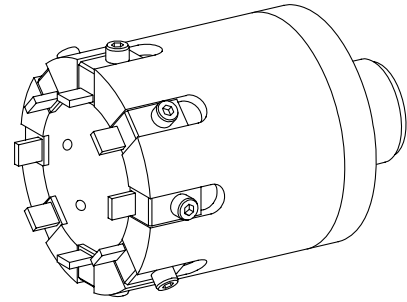
Paragraph	Function - Tool Nomenclature	Tool Number
2	GEARBOX (FRONT) HOUSING - REMOVAL FROM GEARBOX (REAR) HOUSING	
	WRENCH, DRIVE BEVEL SPUR GEARSHAFT INNER RACE RETAINING NUT - - - - -	PWA 57048
	PULLER, HOUSING, GEARBOX, FRONT - - - - -	PWA 56683
	ADAPTER, DRIVE BEVEL GEARSHAFT INNER RACE RETAINING NUT - - - - -	PWA 57049
	PULLER, BEVEL GEARSHAFT DRIVE BEARING INNER RACE UPPER - - - - -	PWA 57050

ILLUSTRATED SUPPORT EQUIPMENT



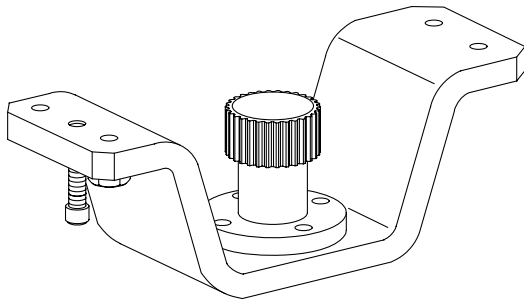
PWA 56683 -C

**Figure T1. PWA 56683 PULLER**



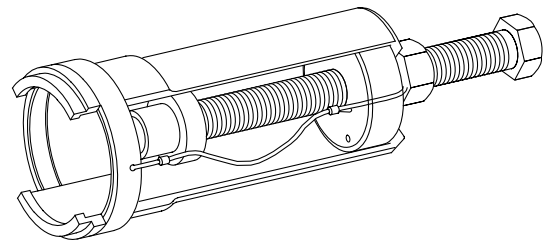
PWA 57048 -C

**Figure T2. PWA 57048 WRENCH**



PWA 57049 -C

**Figure T3. PWA 57049 ADAPTER**



PWA 57050 -C

**Figure T4. PWA 57050 PULLER**

## 1. INTRODUCTION.

- a. This work package contains instructions for separating (front and rear) gearbox housings.
- b. Before gearbox (front) housing is removed from gearbox (rear) housing, gearshaft retaining nut, and duplex ball bearing inner race are removed.

## 2. GEARBOX (FRONT) HOUSING - REMOVAL FROM GEARBOX (REAR) HOUSING.

(See Figures 1 and 2.)

- a. Remove nuts and washers(14, figure 1) securing gearbox (front housing)(15) to rear housing.
- b. Remove three bolts(16) securing deaerator impeller shaft bearing outer race(18). Remove and discard key washers(17).



Failure to remove gearbox front housing as specified, since stub idler gear is attached to front housing, may result in gearshaft roller bearing damage. Do not force housing.

### NOTE

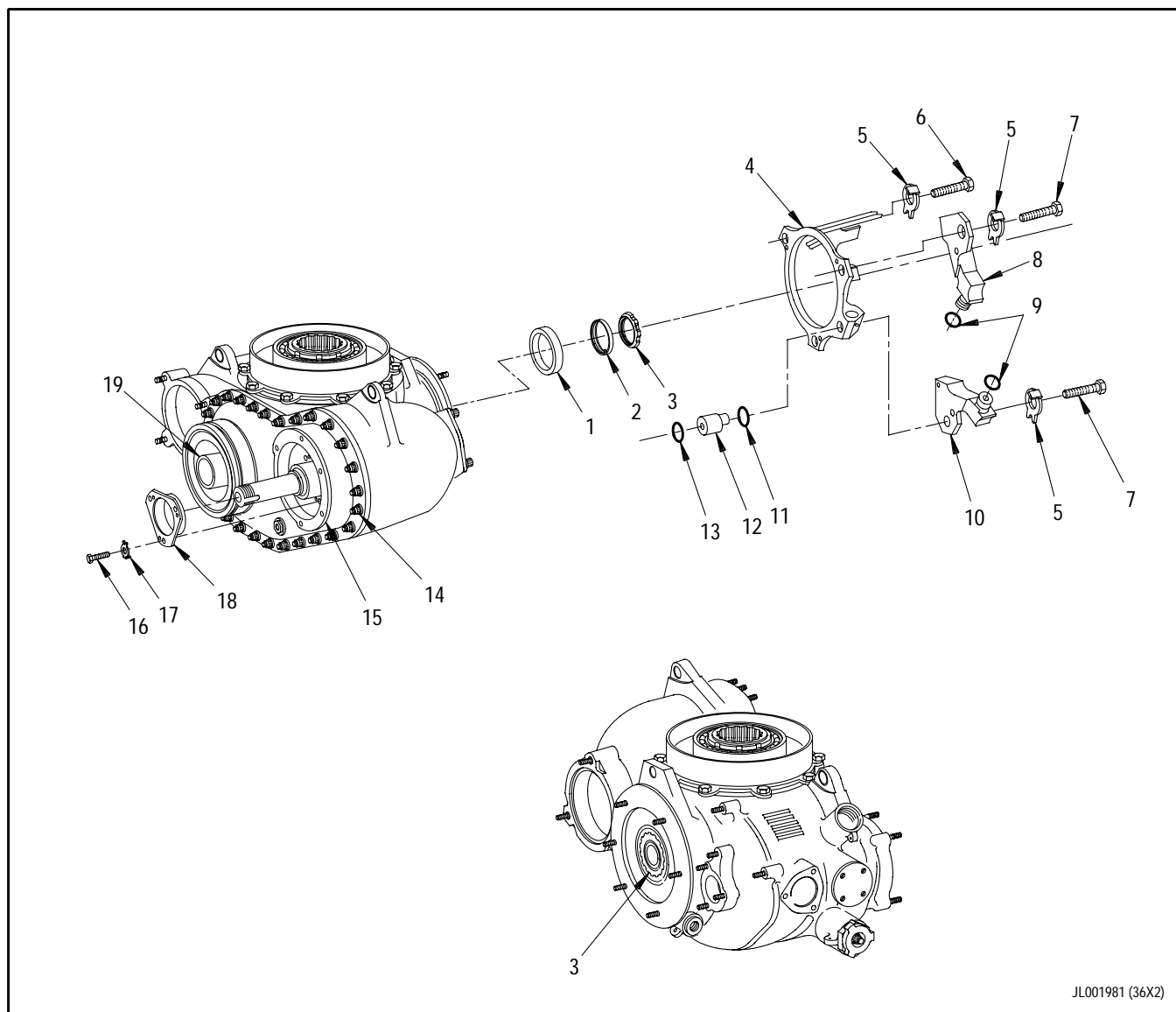
Puller may have to be angled to slide lip into groove of impeller port.

- c. Install PWA 56683 gearbox front housing puller to gearbox front housing as follows:

- (1) Place puller on gearbox front housing. Engage lip feature on puller with groove of center impeller port area flange.
- (2) Align and install detail-10 screws with bolt holes in generator cover bolt circle.
- (3) Gently unseat front cover, using detail-4 slide hammer.

- d. Lift front housing from gearbox slowly until housing clears studs. Carefully slide it to pull front housing slowly from rear housing. Figure 2 shows relative clearance of stub idler gear to gearbox drive spur bevel gearshaft roller bearing details.
- e. Remove PWA 56683 puller from gearbox front housing.
- f. Remove gasket and discard.





JL001981 (36X2)

- |  |                                       |
|--|---------------------------------------|
| 1. Duplex ball bearing inner race (outer half) | 10. Oil nozzle                        |
| 2. Keywasher                                   | 11. Packing                           |
| 3. Duplex bearing retaining nut                | 12. Packing transfer tube             |
| 4. Retaining plate                             | 13. Packing                           |
| 5. Keywasher                                   | 14. Self-locking nuts and washers     |
| 6. Bolt  | 15. Gearbox (front) housing           |
| 7. Bolt  | 16. Bolt                              |
| 8. Oil nozzle                                  | 17. Keywasher                         |
| 9. Packing                                     | 18. Impeller shaft bearing outer race |
|  | 19. Insert PWA 57049 adapter here.    |

**Figure 1. Gearbox Drive Spur Gearshaft Retaining Nut, and Ball Bearing Inner Race - Removal**

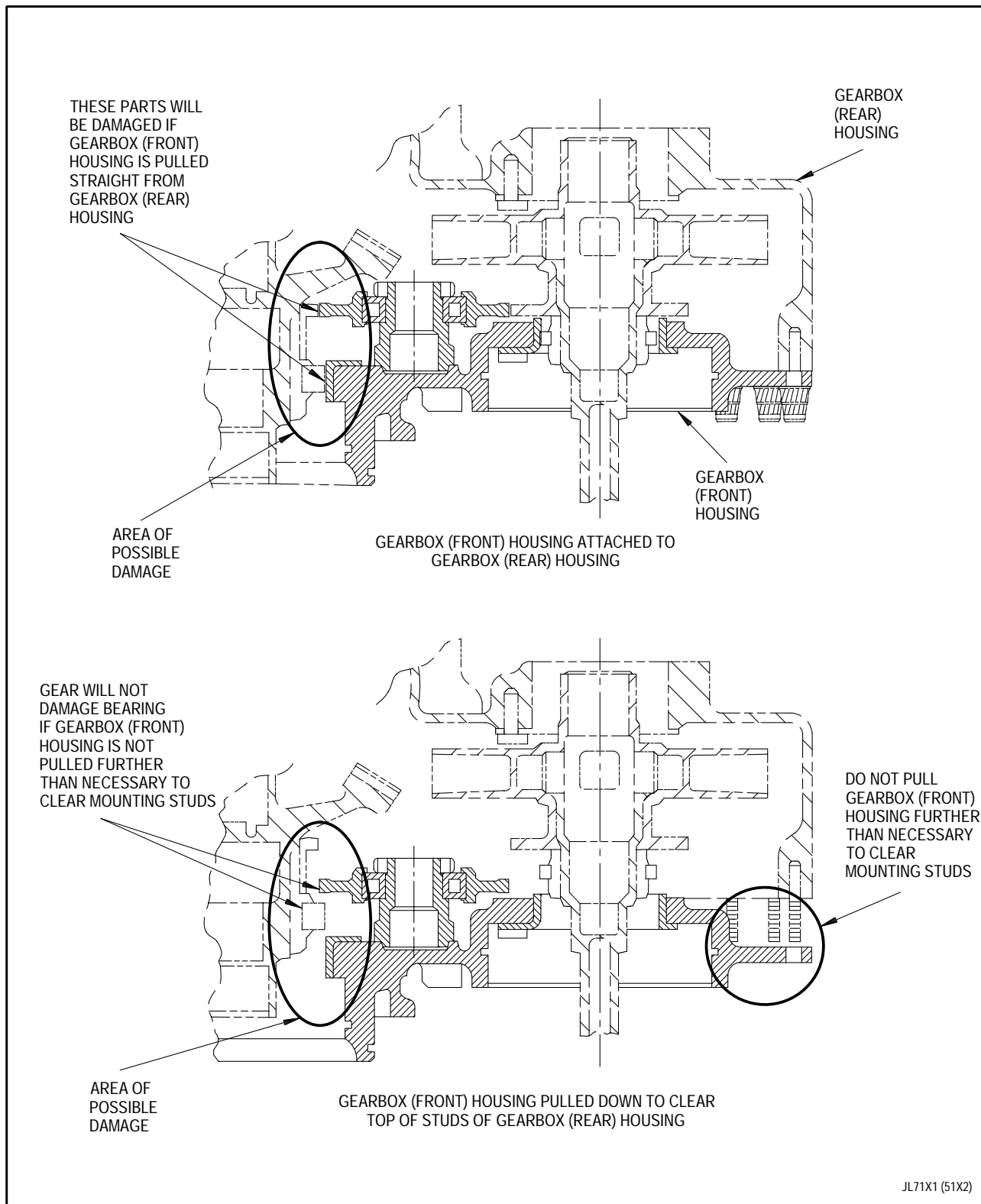


Figure 2. Removal of Gearbox (Front) Housing from Gearbox (Rear) Housing (Sheet 1 of 2)

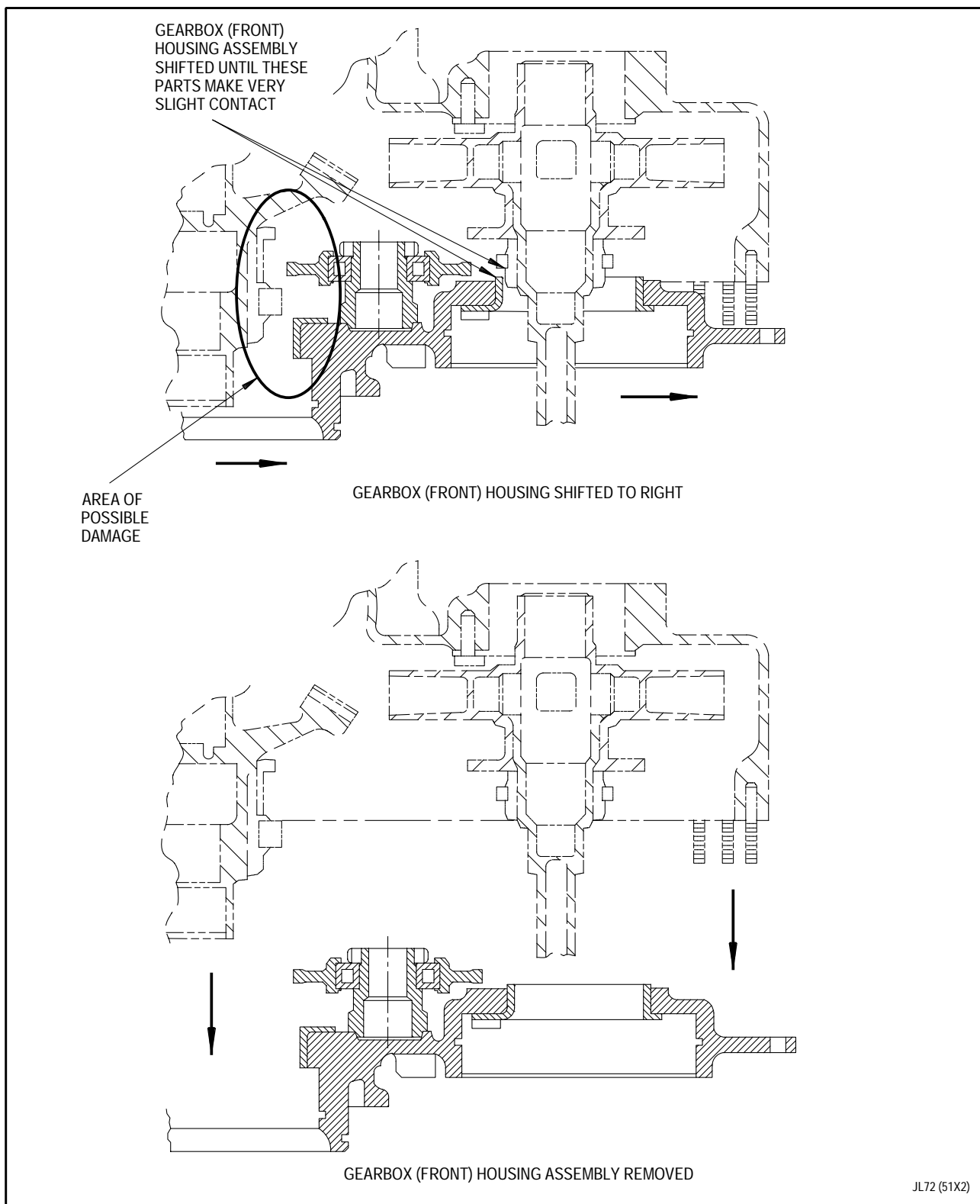


Figure 2. Removal of Gearbox (Front) Housing from Gearbox (Rear) Housing (Sheet 2 of 2)

**3. GEARBOX DRIVE SPUR BEVEL  
GEARSHAFT RETAINING NUT, AND BALL  
BEARING INNER RACE - REMOVAL.**

(See Figure 1.)

- a. Unbend tabs on key washers(5, figure 1).
- b. Remove bolts(6 and 7) securing retaining plate(4) and oil nozzles(8 and 10). Remove and discard key washers(5).
- c. Remove retaining plate(4), oil nozzles(8 and 10), and transfer tube(12).
- d. Remove and discard packings(9), (11), and (13).
- e. Remove duplex bearing retaining nut(3) as follows:
  - (1) Insert splined end of PWA 57049 adapter into end(19) of gearshaft.
  - (2) Install PWA 57048 wrench on retaining nut(3).
  - (3) Use standard box wrench to secure holder; turn wrench to remove nut(3).
  - (4) Remove tools.
  - (5) Remove nut(3) and key washer(2).Discard key washer.

**NOTE**

- For gearboxes incorporating duplex bearing with two piece split inner race, continue with step f.
  - For gearboxes incorporating duplex bearing with one piece inner race, proceed to WP 013 00.
- f. Remove rear ball bearing inner race (outer half)(1) as follows:
    - (1) Retract jackscrew of PWA 57050 puller.
    - (2) Position and secure puller legs in puller groove of bearing.
    - (3) Rotate puller shaft so it cannot pull or manually retain gear shaft.



When inner race is removed, shaft will be free to fall from housing.

- (4) Tighten jackscrew so it pilots into gearshaft, continue to tighten so it pulls inner race off shaft
- (5) Preserve bearing details with engine oil.
- (6) Store inner race in clean, labeled container.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARBOX (FRONT) HOUSING -

### DISASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2 . . . . .	5	4 - 5 . . . . .	5	7 . . . . .	5
3 . . . . .	0	6 . . . . .	0	8 Blank . . . . .	0

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Oil, lubricating	MIL-L-7808

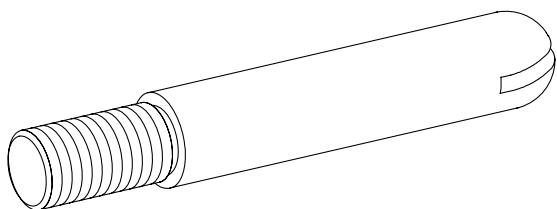
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

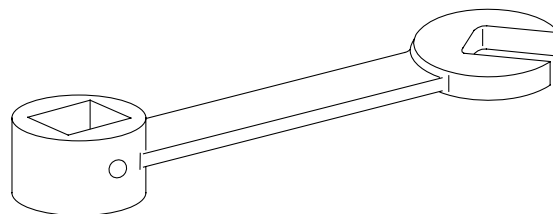
Paragraph	Function - Tool Nomenclature	Tool Number
2	Gearbox Spur Gear and Gearbox Idler Gearshaft Assembly - Removal	
	Wrench, Retaining bolts - - - - -	PWA 50424
	Puller, Assembly from housing - - - - -	PWA 50426
	Wrench, Bearing retaining nut - - - - -	PWA 50430
	Base, Gearbox front housing - - - - -	PWA 56502
		or
		PWA 52760
3	Gearbox Deaerator Impeller Shaft Bearing Outer Race - Removal	
	Pin, Alignment - - - - -	PWA 50403
	Pusher, Deaerator impeller shaft bearing outer race from housing - - - -	PWA 50638
4	Gearbox Drive Gearshaft Bearing Outer Race - Removal	
	Pusher, driveshaft, roller bearing outer race from housing - - - - -	PWA 50471
	Base, Gearbox front housing - - - - -	PWA 52760

ILLUSTRATED SUPPORT EQUIPMENT



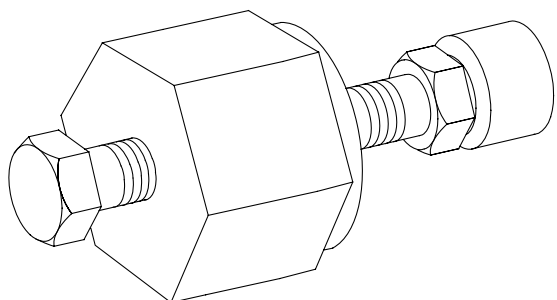
PWA 50403 -C

**Figure T1. PWA 50403 Pin**



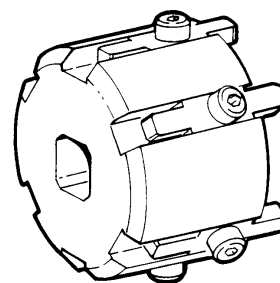
PWA50424 -C

**Figure T2. PWA 50424 Wrench**



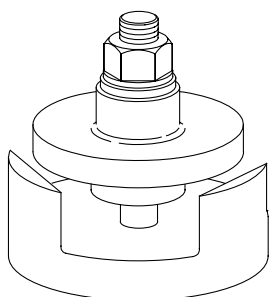
PWA 50426

**Figure T3. PWA 50426 Puller**



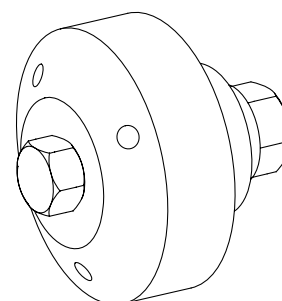
PWA 50430 -C

**Figure T4. PWA 50430 Wrench**



PWA50471 -C

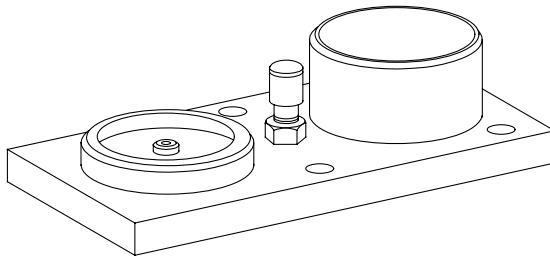
**Figure T5. PWA 50471 Pusher**



PWA50638 -C

**Figure T6. PWA 50638 Pusher**

**ILLUSTRATED SUPPORT EQUIPMENT**



PWA 56502 -C

**Figure T7. PWA 56502 Base**



## 1. INTRODUCTION.

- a. This work package contains instructions for removal of the gearbox spur gear and idler gear shaft assembly, the deaerator impeller outer race, and gearbox spur bevel gearshaft bearing outer race from the gearbox (front) housing.

## 2. GEARBOX SPUR GEAR AND GEARBOX IDLER GEARSHAFT ASSEMBLY - REMOVAL.

(See Figure 1.)

- a. Position gearbox front housing(2, figure 1) on PWA 56502 base.
- b. Remove rivet(7) securing bearing nut(8).
- c. Brace gearbox front housing(2) and using PWA 50430 wrench, remove nut(8).

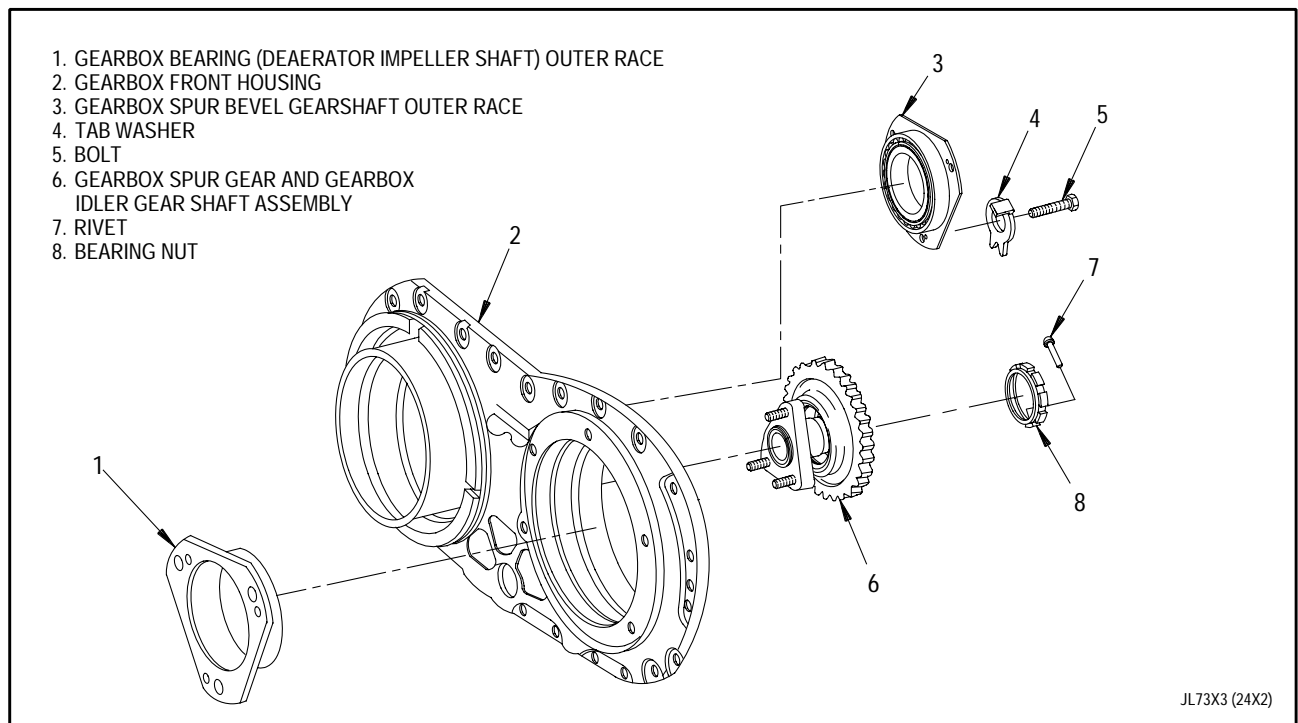


Figure 1. Gearbox Spur Gear and Gearbox Idler Gear Shaft Assembly - Removal

**NOTE**

Interference with gear may prevent bolts from being fully removed from front housing(2).

- d. Using PWA 50424 wrench or equivalent, loosen bolts securing shaft assembly(6) to front housing until gear interferes.

**NOTE**

If bolts do not completely unthread from front housing, shaft shall be pulled out in increments and bolts removed when puller produces enough clearance between gear and bolthead.

- e. Install PWA 50426 puller onto OD threads on end of shaft and tighten jackscrew to remove gearbox spur gear and gearbox idler gearshaft assembly(6) from front housing. If bolts have not been removed completely, remove them when clearance permits. Bolts will be retained in shaft assembly(6) even after removal from front housing.

**3. GEARBOX DEAERATOR IMPELLER SHAFT BEARING OUTER RACE - REMOVAL.**

(See figure 1.)

- a. Install PWA 50403 pins in boltholes.
- b. Position PWA 50638 pusher detail retainer assembly over bearing flange and engage pins.
- c. Position detail pusher plate and nut from inside face of front housing over stud of detail retainer assembly.
- d. Using standard wrenches, hold bolthead of detail retainer and turn detail nut to produce jackscrew action to remove race(1, figure 1). Remove tools.
- e. Preserve bearings or bearing details with lubricating oil.
- f. Store race in clean, labeled container.

#### 4. GEARBOX SPUR BEVEL GEARSHAFT BEARING OUTER RACE - REMOVAL.

(See figure 1.)

- a. Position gearbox front housing(2, figure 1) on PWA 56502 base.
- b. Remove bolts(5) and key washers(4) securing outer race(3) to front housing(2). Discard key washers.
- c. Remove gearbox front housing(2) from PWA 52760 base.
- d. Install detail bolt in detail retainer of PWA 50471 pusher, install retainer on inside of housing so bolt passes through bearing bore and feet of retainer sets on housing, not on flange of race.
- e. Position detail pusher on detail bolt and secure with detail nut so pusher is centered in race.
- f. Using standard wrenches, hold bolthead of detail retainer and turn detail nut to remove race. Remove tools.
- g. Preserve bearing details with lubricating oil.
- h. Store race in clean, labeled container.



**WORK PACKAGE****TECHNICAL PROCEDURES**

**GEARBOX (REAR) HOUSING  
(INCORPORATING PTO DUPLEX BEARING  
WITH SPLIT INNER RACE) -**

**DISASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 22

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 2 . . . . .	22	8 - 10 . . . . .	0	16B Blank Added . . . . .	2
3 . . . . .	16	11 . . . . .	16	17 . . . . .	0
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**T.O. 2J-F100-53-11**

**WP 014 00**

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

**Nomenclature**

**Specification/Vendor Part Number**

OIL, LUBRICATING

MIL-L-7808

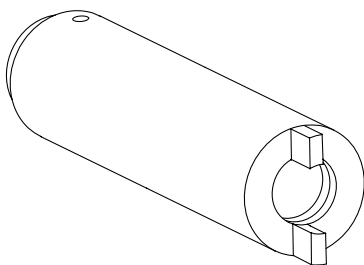
**EXPENDABLE ITEMS**

None

## APPLICABLE SUPPORT EQUIPMENT

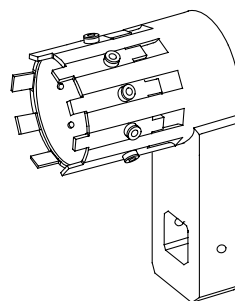
Paragraph	Function - Tool Nomenclature	Tool Number
3	GEARBOX DEAERATOR IMPELLER SHAFT AND BEARING ASSEMBLY AND GEARBOX SPUR BEVEL GEARSHAFT ASSEMBLY - REMOVAL	
	GEARBOX DEAERATOR IMPELLER SHAFT AND BEARING ASSEMBLY AND GEARBOX SPUR BEVEL GEARSHAFT ASSEMBLY, REMOVAL - - - - -	
	HOLDER, DEAERATOR IMPELLER SHAFT - - - - -	PWA 50406
	WRENCH, DEAERATOR IMPELLER SHAFT ROLLER BEARINGSRETAINING NUT - - - - -	PWA 50407
	PULLER, DEAERATOR IMPELLER SHAFT ROLLER BEARINGINNER RACE AND SPUR GEAR - - - - -	PWA 50409
	PULLER, DEAERATOR IMPELLER SHAFT DEAERATOR - - - - -	PWA 50410
	HOLDER, IGNITION ALTERNATOR DRIVE SHAFT - - - - -	PWA 56685
	WRENCH, DEAERATOR IMPELLER SHAFT BALL BEARINGSRETAINING NUT - - - - -	PWA 55824
	WRENCH, DEAERATOR IMPELLER SHAFT BALL BEARINGSRETAINING NUT - - - - -	PWA 57108
	RETAINER, DEAERATOR IMPELLER SHAFT BALLBEARING - -	PWA 57105
	PULLER, DEAERATOR IMPELLER SHAFT FROM BALLBEARING	PWA 57117
	ADAPTER, TORQUE, BEVEL GEARSHAFT DRIVE DUPLEXBEARING NUT - - - - -	PWA 57049
5	BEARING ASSEMBLY AND GEARBOX BEARING PACKING TRANSFER TUBE - REMOVAL	
	GEARBOX SPUR GEARSHAFT AND GEARBOX BEARING HOUSING, REMOVAL - - - - -	
	PULLER, OIL PUMP DRIVE IDLER SHAFT ROLLER BEARING OUTER RACE - - - - -	PWA 50451
	PIN, ALIGNING, GEARSHAFT BALL BEARING PACKAGE - - -	PWA 50876
	PULLER, OIL PUMP DRIVE IDLER GEAR BALL BEARING HOUSING - - - - -	PWA 57046
6	GEARBOX SPUR GEARSHAFT AND GEARBOX BEARING HOUSING - REMOVAL	
	BEARING ASSEMBLY AND GEARBOX BEARING PACKING TRANSFER TUBE, REMOVAL - - - - -	
	PULLER, GEARBOX BEARING TRANSFER TUBE - - - - -	PWA 55535 OR
	PULLER, GEARBOX BEARING TRANSFER TUBE - - - - -	PWA 57369
	PULLER, MAIN GEARBOX DUPLEX BEARING PLATE - - - - -	PWA 57124

ILLUSTRATED SUPPORT EQUIPMENT



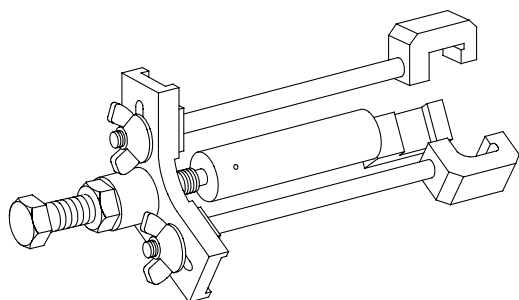
PWA 50406 -C

**Figure T1. PWA 50406 HOLDER**



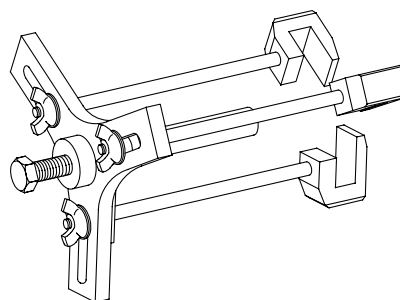
PWA 50407 -C

**Figure T2. PWA 50407 WRENCH**



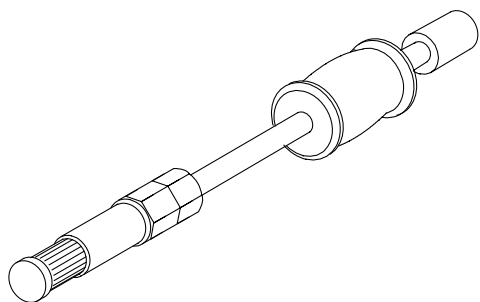
PWA 50409

**Figure T3. PWA 50409 PULLER**



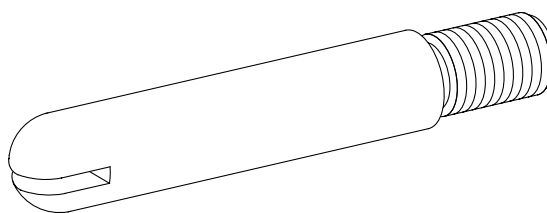
PWA 50410

**Figure T4. PWA 50410 PULLER**



GC  
PWA 50451 -C

**Figure T5. PWA 50451 PULLER**

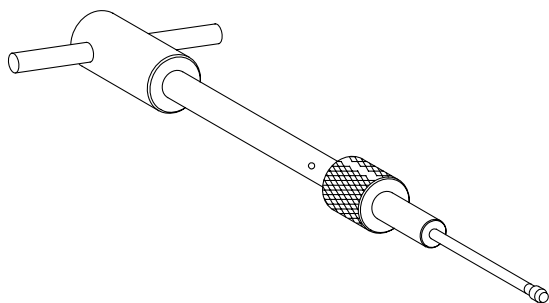


PWA 50876 -C

**Figure T6. PWA 50876 PIN**

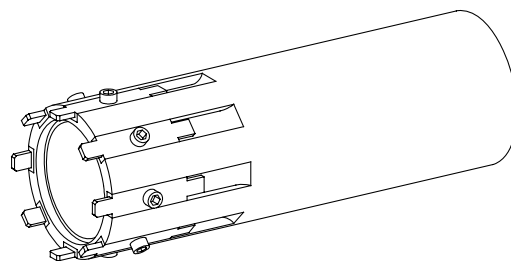


ILLUSTRATED SUPPORT EQUIPMENT (continued)



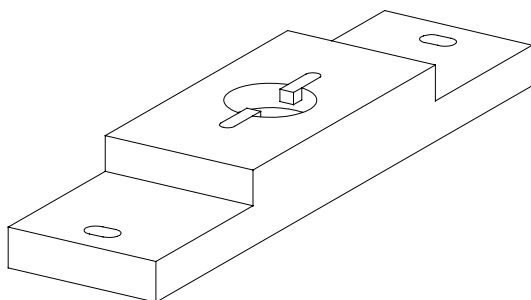
PWA55535 -C

Figure T7. PWA 55535 PULLER



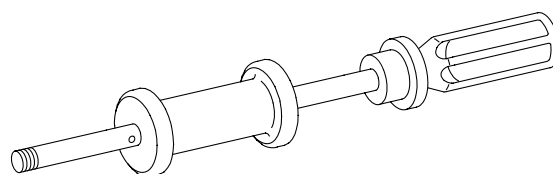
PWA 55824 -C

Figure T8. PWA 55824 WRENCH



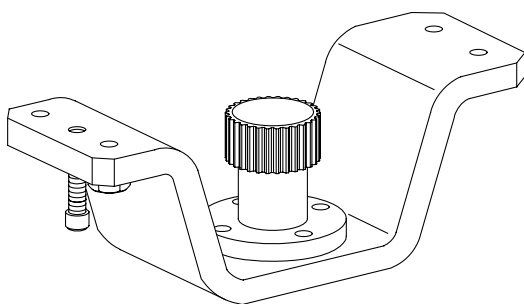
PWA 56685 -C

Figure T9. PWA 56685 HOLDER



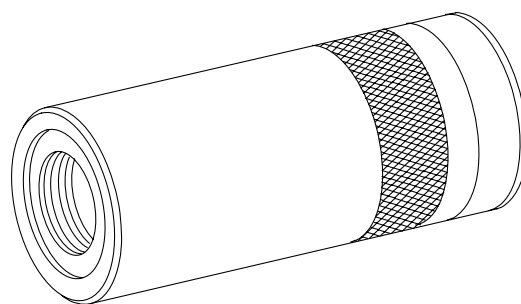
PWA57046 -C

Figure T10. PWA 57046 PULLER



PWA 57049 -C

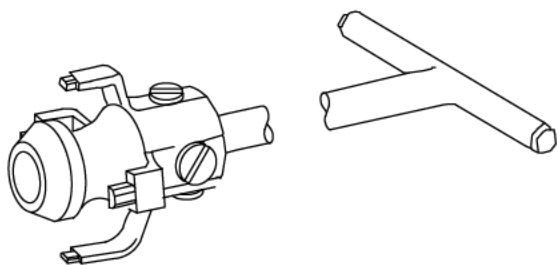
Figure T11. PWA 57049 ADAPTER



PWA 57105 -C

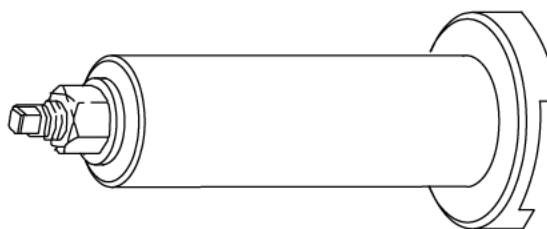
Figure T12. PWA 57105 RETAINER

ILLUSTRATED SUPPORT EQUIPMENT (continued)



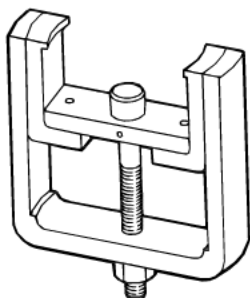
PWA 57108 -C

**Figure T13. PWA 57108 WRENCH**



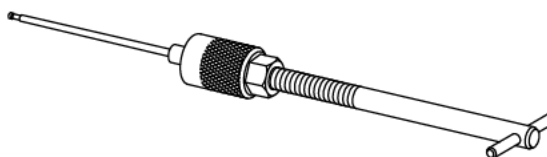
PWA 57117 -C

**Figure T14. PWA 57117 PULLER**



PWA 57124 -C

**Figure T15. PWA 57124 PULLER**



PWA 57369 -C

**Figure T16. PWA 57369 PULLER**

**1. INTRODUCTION.****NOTE**

Gearbox rear housings incorporating PTO gearshaft duplex bearing with one piece inner race shall be disassembled per SWP 014 01.

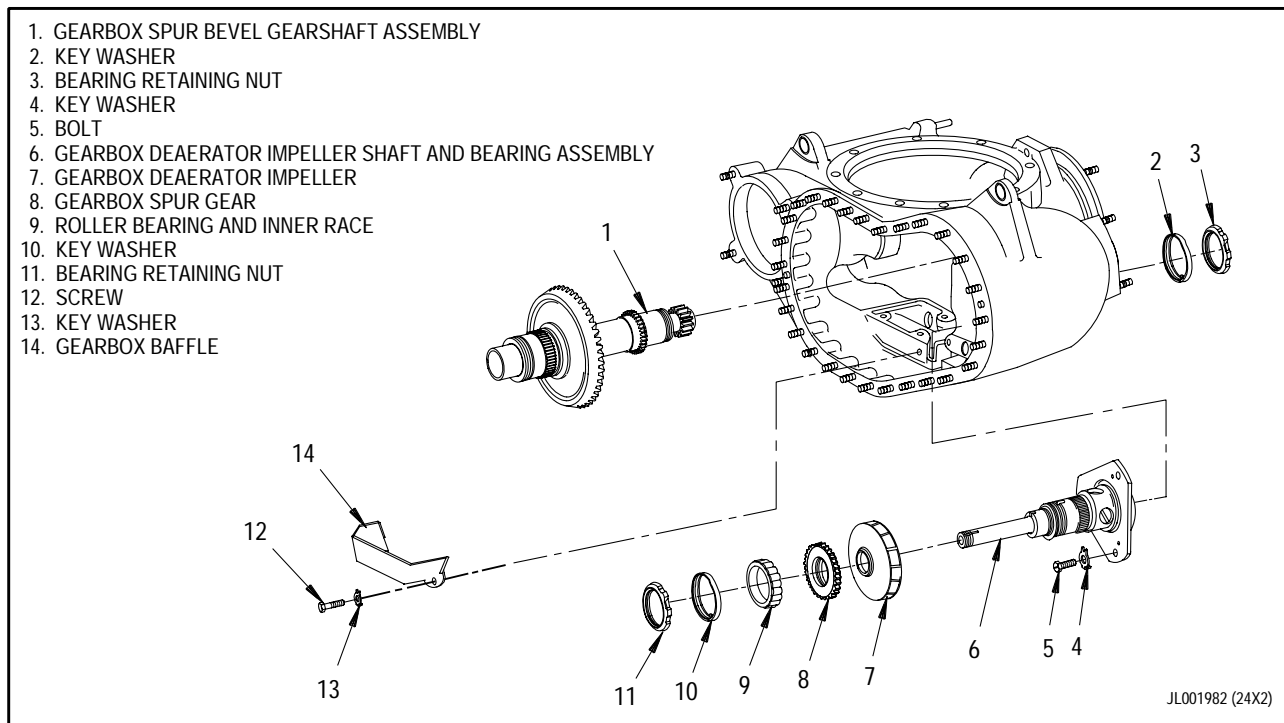
- a. This work package contains instructions for removal of gearshaft subassemblies, bearings, and associated parts from gearbox rear housings incorporating PTO gearshaft duplex bearing with two piece split inner race.

**2. GEARBOX BAFFLE AND GEARBOX HOUSING BAFFLE - REMOVAL.**

(See Figure 1.)

- a. Remove gearbox baffle(14, figure 1) as follows:

- (1) Remove screw(12) and key washer(13). Discard key washer.
- (2) Lift baffle(14) out of gearbox housing.



**Figure 1. Gearbox Baffle and Gearbox Housing Baffle, Gearbox Impeller Shaft and Bearing Assembly, and Gearbox Spur Bevel Gearshaft Assembly - Removal**

### 3. GEARBOX DEAERATOR IMPELLER SHAFT AND BEARING ASSEMBLY AND GEARBOX SPUR BEVEL GEARSHAFT ASSEMBLY - REMOVAL.

(See figure 1 and Figures 2 and 3.)

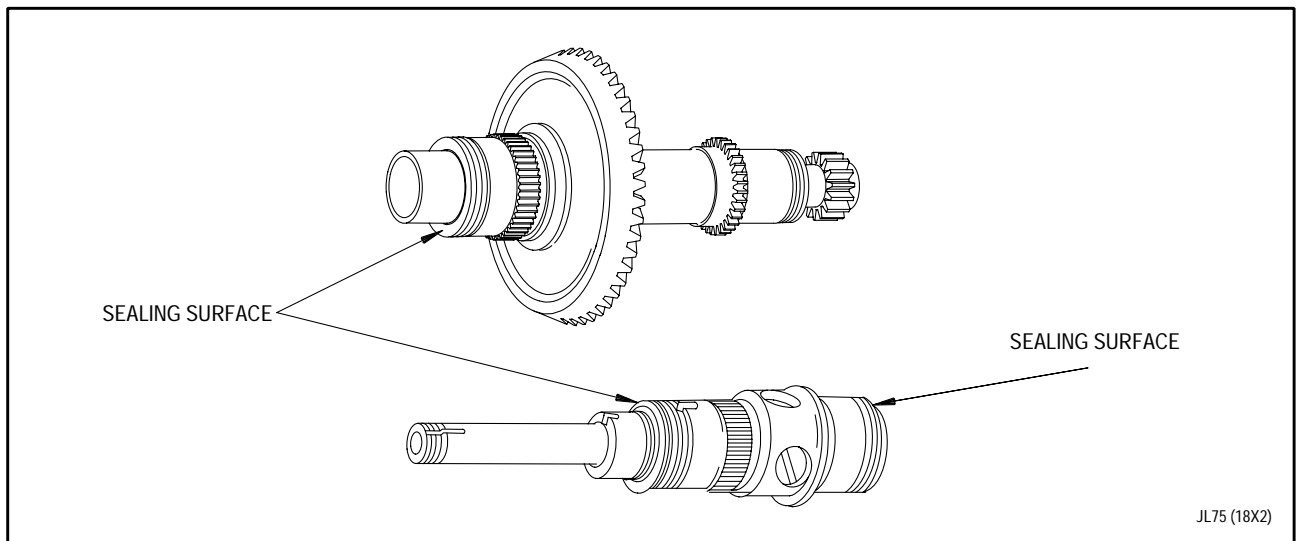
- a. Remove bearing retaining nut(11, figure 1) as follows:



Front surfaces of shaft serves as seal seat for carbon seal.  
(See figure 2.) Avoid damage to surface.

- (1) Place PWA 50406 holder over end of gearbox deaerator impeller shaft and bearing assembly(6), and engage two lugs of holder in two slots on each side of shaft. Pilot PWA 50406 wrench over PWA 50406 holder and engage teeth of wrench into bearing retaining nut(11).

- (2) Install two breaker bars onto PWA 50406 holder and PWA 50407 wrenches and remove bearing retaining nut(11). Discard key washer(10). Remove tools.



**Figure 2. Gearbox Spur Bevel Gearshaft and Deaerator Impeller Shaft - Sealing Surfaces**

b. Remove roller bearing and inner race(9) and gearbox spur gear(8) as follows:

- (1) Retract jackscrew detail of PWA 50409 puller.
- (2) Loosen wing nuts of puller jaws and place jaws around gearbox spur gear(8). Tighten wing nuts.
- (3) Using wrench or sliding T-handle, tighten jackscrew and remove gearbox spur gear(8) and roller bearing and inner race(9). Remove tool.
- (4) Preserve bearings or bearing details with engine oil and place them in protective, labeled containers.
- (5) Store roller bearing and inner race(9) in a clean, labeled container.

c. Remove gearbox deaerator impeller(7) as follows:

- (1) Retract jackscrew detail of PWA 50410 puller.
- (2) Loosen wing nuts of puller jaws and place jaws around gearbox deaerator impeller(7). Tighten wing nuts.
- (3) Using wrench or sliding T-handle, tighten jackscrew and remove gearbox deaerator impeller(7). Remove tool.

d. Remove gearbox deaerator impeller shaft and bearing assembly(6) from housing as follows:

- (1) Remove bolts(5) and key washers(4). Discard key washers.

- (2) Remove bearing retaining nut(3, figure 1) as follows:



Use care in following procedure to prevent damaging surface of shaft.

#### NOTE

Rear surface of shaft acts as sealing seat for gearbox breather valve carbon seal.

- (a) Install PWA 56685 holder over end of gearbox deaerator impeller shaft and bearing assembly(6, figure 1) and engage two lugs of holder in two slots on shaft. Secure holder to gearbox housing studs, using gearbox housing hardware. Torque nuts 180 to 230 pound-inches.
- (b) Install PWA 55824 wrench on bearing retaining nut(3).
- (c) Using standard breaker bars, loosen bearing nut(3), using PWA 55824 wrench. Remove PWA 55824 wrench. Remove PWA 55824 wrench.
- (d) Install PWA 57108 wrench in two slots of bearing retaining nut(3).
- (e) Remove bearing retaining nut(3). Discard key washer(2). Remove tooling.
- (3) Thread PWA 57105 retainer(1, figure 3) onto rear of deaerator impeller shaft(3).
- (4) Using PWA 57117 puller(2), remove shaft from gearbox housing as follows:
  - (a) Remove flanged nut detail of PWA 57117 puller(2) and remove housing from puller legs section of tool.
  - (b) Engage puller legs into holes in deaerator impeller shaft(3).
  - (c) Slide housing forward until housing contacts wall of gearbox. Install flanged nut.

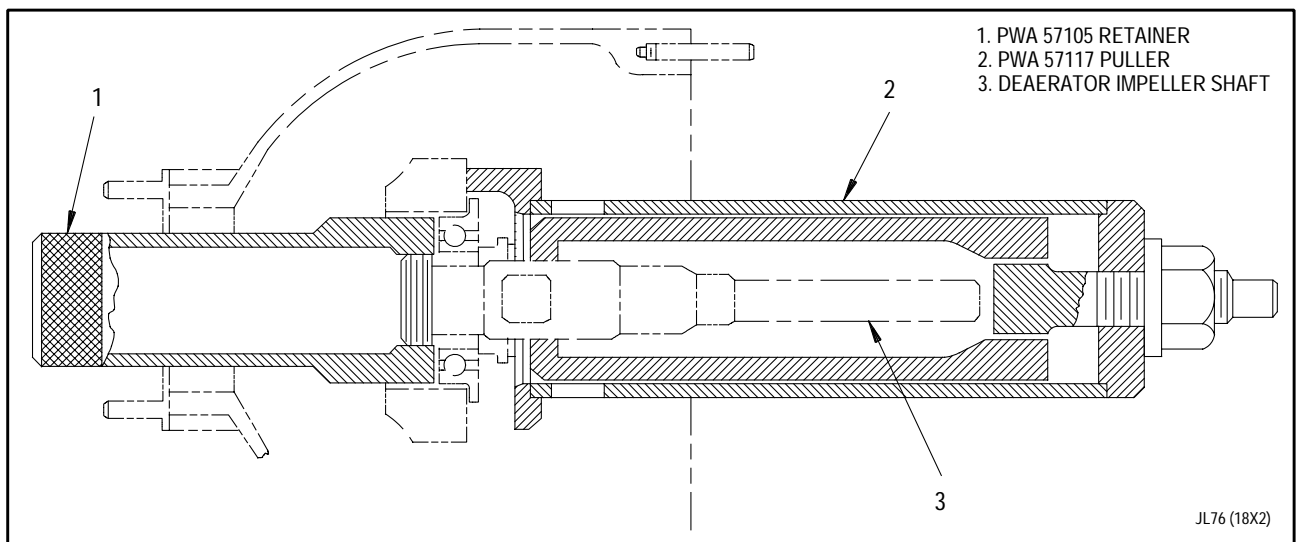


Figure 3. Deaerator Impeller Shaft - Removal

- (d) Pull shaft and bearing from housing by tightening flanged nut while holding square end of threaded detail with wrench.

- (e) Remove tooling.



Front surface of shaft acts as sealing seat for carbon seal. (See figure 2). Handle shaft carefully to prevent damage to surface finish.

- (f) Store shaft to prevent damage to sealing surfaces.
- (g) Preserve bearings or bearing details with engine oil and place them in protective, labeled containers.

- e. Remove gearbox spur bevel gearshaft assembly(1, figure 1) as follows:

- (1) Install splined end of PWA 57049 adapter into end of gearshaft(1) and secure to gearbox (rear) housing.

- (2) Remove gearbox bearing housing(16, figure 4) as follows:

- (a) Remove adapter(20) from bearing housing(16). Remove and discard packing(19).

- (b) Remove nuts(17) and bracket(18 or 21).

- (c) Using PWA 57046 puller, remove bearing housing(16). Remove and discard packing(15).

- (3) Using mallet and nylon drift, carefully tap (through main oil pump mount pad) gearbox spur gearshaft(13) down to rest on bottom of gearbox.

- (4) Remove PWA 57049 adapter.

- (5) Carefully remove gearbox spur bevel gearshaft assembly.

#### 4. GEARBOX BEVEL GEARSHAFT ASSEMBLY, GEARBOX SCAVENGE TUBES, AND GEARBOX SUMP COVER ASSEMBLY - REMOVAL.

(See Figure 4.)

- a. Remove gearbox (rear) housing(11, figure 4) from PWA 27606 stand and place on work bench.

- b. Remove gearbox bevel gearshaft assembly(9, figure 4), gearbox sump cover assembly(5), and gearbox scavenge tubes(3 and 4) as follows:

- (1) Deleted.

- (2) Remove lockwire, bolts(22) and washers(23) from location A. Remove remaining bolts(7) and key washers(8) securing gearshaft assembly(9) to gearbox housing. Discard key washers.

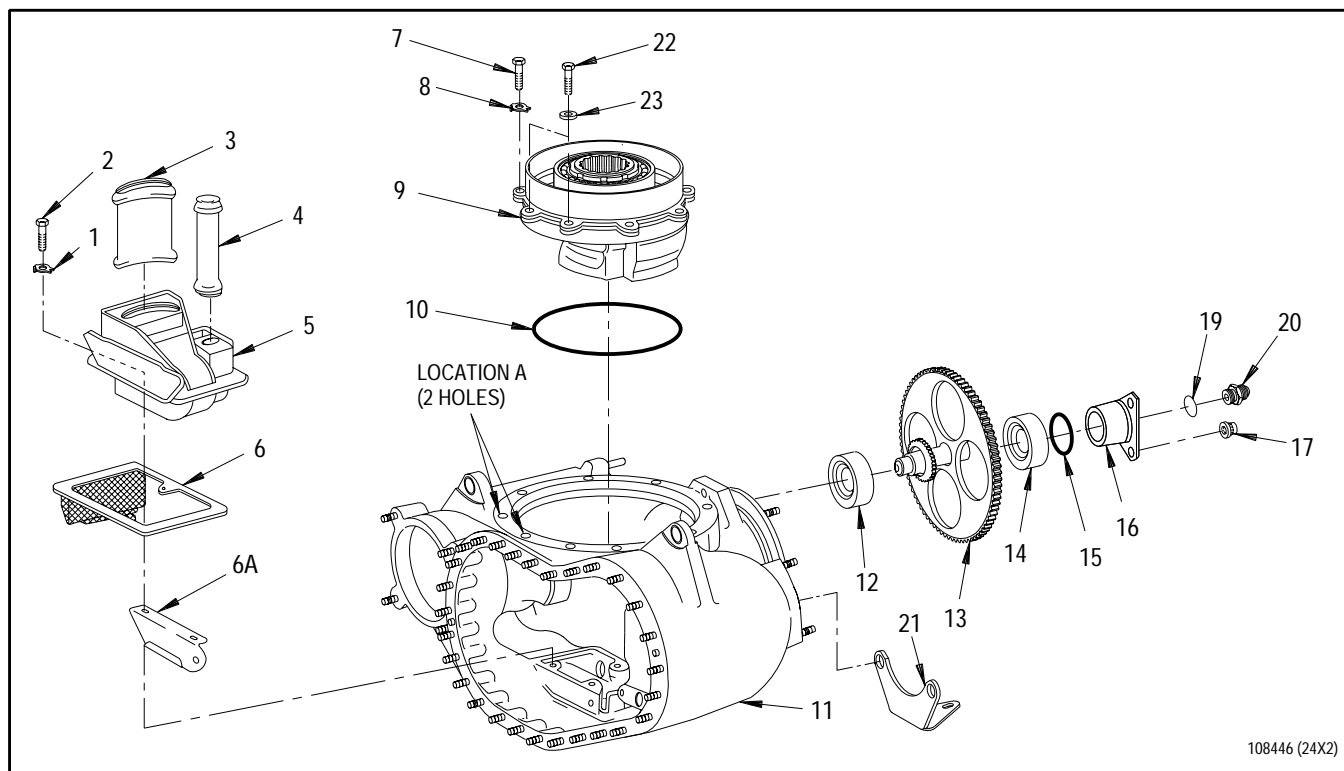


(3) Pull gearshaft assembly(9) from gearbox housing and remove packing(10). Discard packing.

(4) Lift gearbox scavenge tubes(3 and 4) from cover assembly(5).

(5) Remove screws(2) and key washers(1) securing cover assembly(5) and protective screen(6) to gearbox housing. Remove cover assembly(5) and protective screen(6). Discard key washers.

(6) Remove gearbox housing baffle(6A).



108446 (24X2)

- |                                     |                             |
|-------------------------------------|-----------------------------|
| 1. Key washer                       | 13. Gearbox spur gearshaft  |
| 2. Screw                            | 14. Bearing option          |
| 3. Gearbox scavenge tube            | 15. Packing                 |
| 4. Gearbox scavenge tube            | 16. Gearbox bearing housing |
| 5. Gearbox sump cover assembly      | 17. Nut                     |
| 6. Protection screen                | 18. Deleted                 |
| 6A. Gearbox housing baffle          | 19. Packing                 |
| 7. Bolt                             | 20. Adapter                 |
| 8. Key washer                       | 21. Bracket                 |
| 9. Gearbox bevel gearshaft assembly | 22. Bolt                    |
| 10. Packing                         | 23. Washer                  |
| 11. Gearbox rear housing            |                             |
| 12. Bearing option                  |                             |

**Figure 4. Gearbox Bevel Gearshaft Assembly, Gearbox Sump Cover Assembly, Gearbox Spur Gearshaft Assembly, and Gearbox Scavenge Tubes - Removal**

## 5. BEARING ASSEMBLY AND GEARBOX BEARING PACKING TRANSFER TUBE - REMOVAL.

(See Figures 5 and 6.)

- a. Remove fluid passage bolt(7, figure 5). Discard packing(6).

### NOTE

- There are two configurations of gearbox bearing packing transfer tube(4), internally threaded and unthreaded.
- Comply with step b or b.1 for threaded transfer tube(4), or step c for unthreaded.

- b. Remove (threaded) gearbox bearing packing transfer tube(4) using PWA 55535 puller as follows:

- (1) Loosen detail-2 knurled pull rod and insert puller into transfer tube(4).
- (2) Tighten detail-2 knurled pull rod. End of detail-1 rod will expand slightly and grip inside of transfer tube.

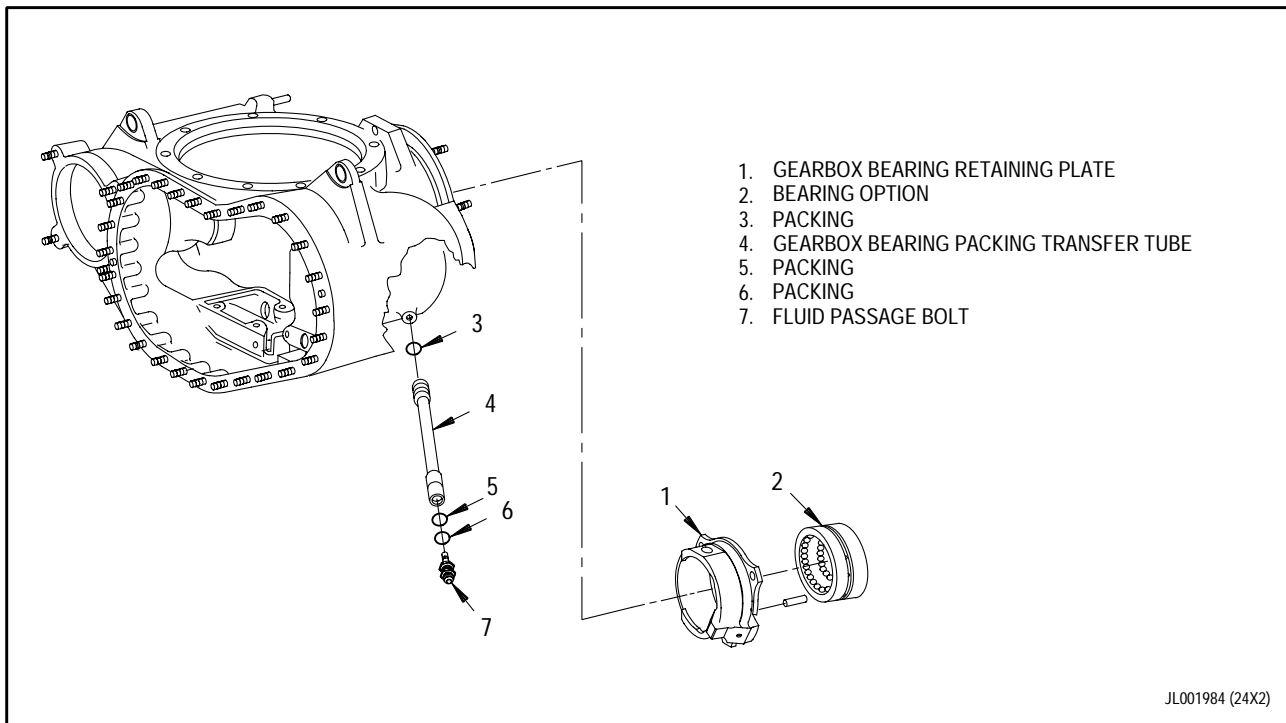
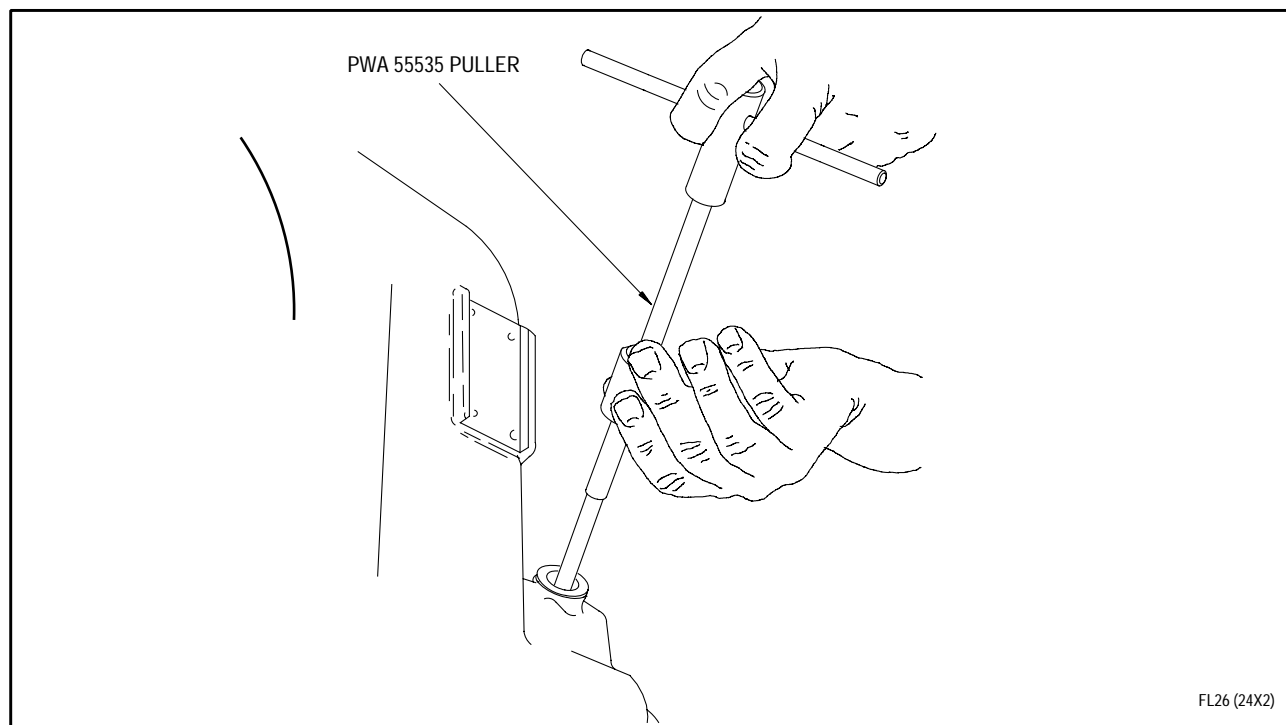
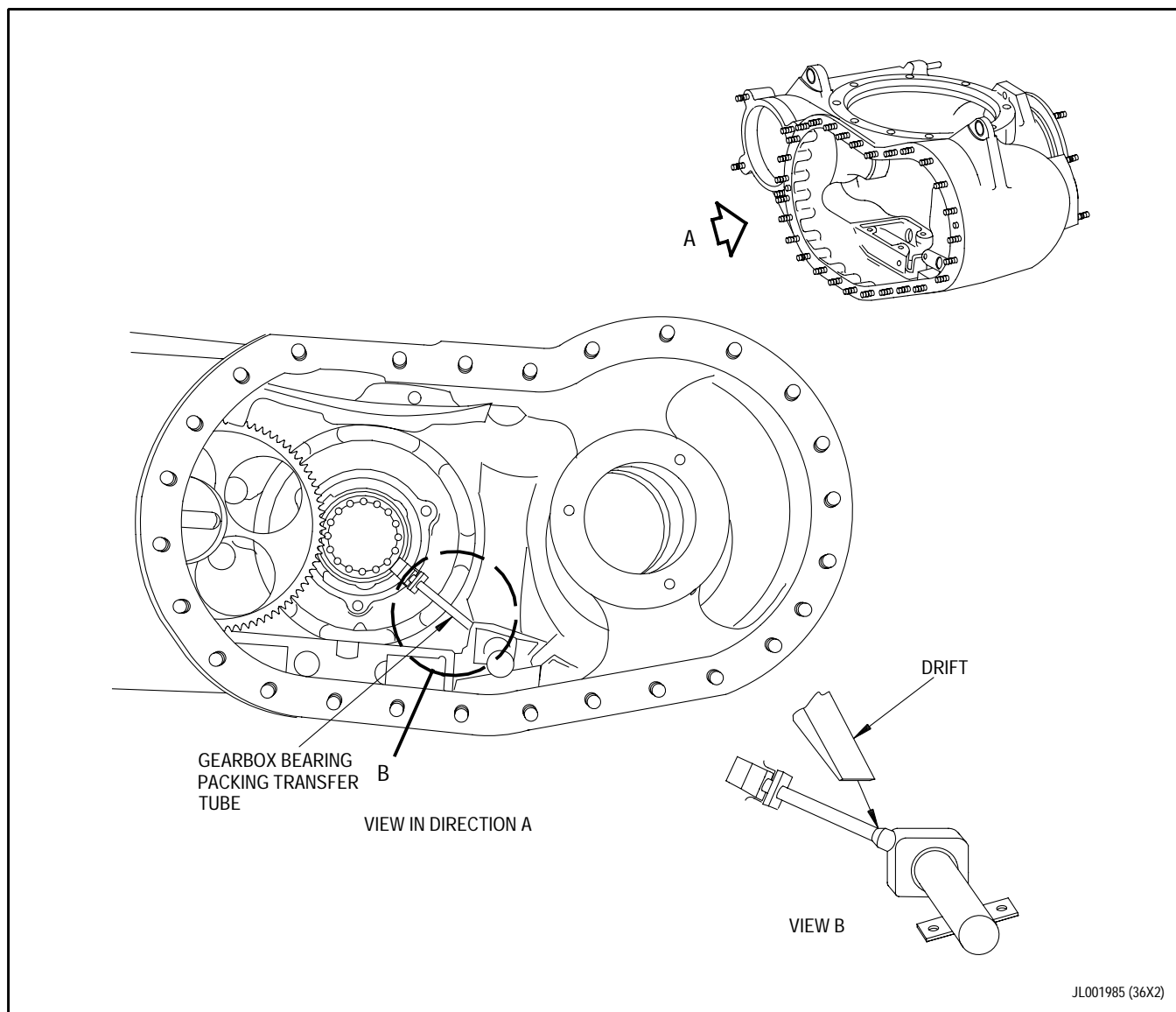


Figure 5. Bearing Assembly and Gearbox Bearing Packing Transfer Tube - Removal

- (3) Pull transfer tube(4) from gearbox housing using PWA 55535 puller.  
(See figure 6.)
  - (4) Loosen detail-2 knurled pull rod and remove PWA 55535 puller from transfer tube(4, figure 5).
- b1. Remove (threaded) gearbox bearing packing transfer tube(4) using PWA 57369 puller as follows:
- (1) Loosen ``T`` handle and detail-2 knurled nut. Insert puller into transfer tube(4) until puller tube assembly detail-1 seats against transfer tube outer end.
  - (2) Tighten detail-2 knurled nut until it contacts gearbox housing, continue tightening with hand pressure or careful use of wrench to loosen transfer tube.
  - (3) Pull transfer tube from gearbox housing using PWA 57369 puller.
  - (4) Loosen knurled nut and ``T`` handle. Remove PWA 57369 puller from transfer tube.
- c. Using mallet and nylon drift, carefully remove unthreaded gearbox bearing packing transfer tube (see figure 6 sheet 2).
- d. Remove and discard packings.
- e. Remove gearbox bearing retaining plates(1, figure 5) as follows:
- (1) Install PWA 50876 pins to prevent cocking retaining plate(1) during removal.
  - (2) Install PWA 57124 retaining plate puller by retracting puller nut detail, and positioning jaws into puller slot at lower end of retaining plate(1). Position outer leg details on gearbox housing.
  - (3) Using wrench, activate jackscrew to remove retaining plate(1) and bearing option(2).



**Figure 6. Gearbox Bearing Packing Transfer Tube - Removal (Sheet 1 of 2)**



**Figure 6. Gearbox Bearing Packing Transfer Tube - Removal (Sheet 2 of 2)**



- f. Remove PWA 57124 retaining plate puller and PWA 50876 pins.

**NOTE**

If race of bearing option(2) cannot be removed from retaining plate(1) by hand, special tools shall be used. If necessary, remove race per WP 024 00.

- g. With gloved hands, remove outer race of bearing option(2) from retaining plate(1).

- h. Preserve bearings or bearing details with engine oil and place them in protective, labeled containers.

- i. Store outer race of bearing option(2) with previously removed rear inner race until remaining inner race is removed. Take appropriate precautions to protect bearing details from damaging each other.

**6. GEARBOX SPUR GEARSHAFT AND  
GEARBOX BEARING HOUSING - REMOVAL.**

(See figure 4.)

- a. Remove gearbox spur gearshaft(13) and bearing options(12 and 14) by lifting it from outer race of roller bearing, then cocking it sideways.

- b. Remove outer race of roller bearing option(12) from housing as follows:

- (1) With collet of PWA 50451 puller in free position, insert collet through housing and through bearing.

- (2) Ensure collet is properly in place. Expand collet by holding lower wrench flats while tightening upper wrench flats.

- (3) Ensure puller lip on collet engages end face rather than raceway. Remove race from housing using knocker action.

- (4) Discard bearing.



## 7. GEARBOX BEARING (OIL) NOZZLE - REMOVAL.

(See Figure 7.)

a. Remove oil nozzle from gearbox rear housing as follows:

(1) Remove screws(3) and key washers(2). Discard key washers.

(2) Remove gearbox bearing (oil) nozzle(1) and packing(4). Discard packing.

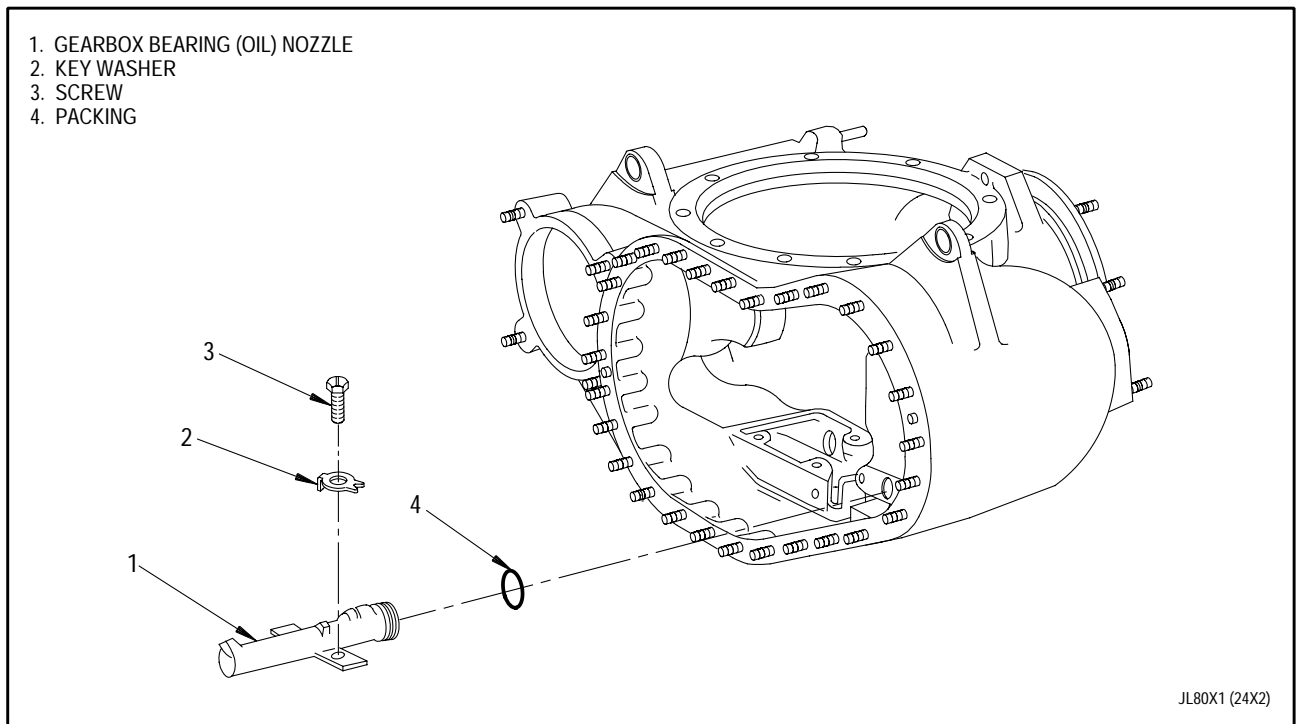


Figure 7. Gearbox Bearing (Oil) Nozzle - Removal



**SUBORDINATE WORK PACKAGE****TECHNICAL PROCEDURES**

**GEARBOX (REAR) HOUSING  
(INCORPORATING PTO DUPLEX BEARING  
WITH ONE PIECE INNER RACE) -**

**DISASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE SWP PAGES**

Total Number of Pages in this SWP is 20

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
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4 . . . . .	9	10 - 11 . . . . .	9	19 . . . . .	9
5 - 6 . . . . .	16	12 - 13 . . . . .	22	20 Blank . . . . .	9

**T.O. 2J-F100-53-11**

**SWP 014 01**

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

<b>T. O. No.</b>	<b>Date</b>	<b>Level</b>	<b>Title (ECP No.)</b>
2J-F100229(V)-504	15 SEP 94	D	Installation of increased life power take off (PTO) duplex bearing PN 4080062-01, F100-PW-229 Engines, F-15/F-16 Aircraft (ECP 92QA151)

**CONSUMABLE MATERIALS**

<b>Nomenclature</b>	<b>Specification/Vendor Part Number</b>
OIL, LUBRICATING	MIL-L-7808

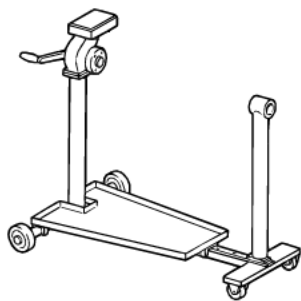
**EXPENDABLE ITEMS**

None

## APPLICABLE SUPPORT EQUIPMENT

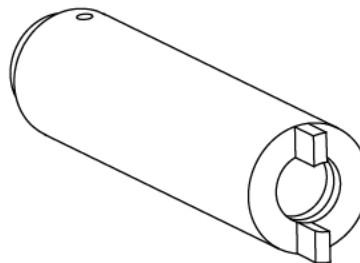
Paragraph	Function - Tool Nomenclature	Tool Number
3	GEARBOX DEAERATOR IMPELLER SHAFT AND BEARING ASSEMBLY AND GEARBOX SPUR BEVEL GEARSHAFT ASSEMBLY - REMOVAL	
	HOLDER, DEAERATOR IMPELLER SHAFT - - - - -	PWA 50406
	WRENCH, DEAERATOR IMPELLER SHAFT ROLLER	
	BEARINGSRETAINING NUT - - - - -	PWA 50407
	PULLER, DEAERATOR IMPELLER SHAFT ROLLER	
	BEARINGINNER RACE AND SPUR GEAR - - - - -	PWA 50409
	PULLER, DEAERATOR IMPELLER SHAFT DEAERATOR - - - - -	PWA 50410
	HOLDER, IGNITION ALTERNATOR DRIVE SHAFT - - - - -	PWA 56685
	WRENCH, DEAERATOR IMPELLER SHAFT BALL	
	BEARINGSRETAINING NUT - - - - -	PWA 55824
	WRENCH, DEAERATOR IMPELLER SHAFT BALL	
	BEARINGSRETAINING NUT - - - - -	PWA 57108
	RETAINER, DEAERATOR IMPELLER SHAFT BALLBEARING - -	PWA 57105
	PULLER, DEAERATOR IMPELLER SHAFT FROM BALLBEARING	PWA 57117
	PULLER, HOUSING, GEARBOX BEARING OIL PUMP IDLER	
	GEAR - - - - -	PWA 57046
	PUSHER/PULLER, PTO DUPLEX BEARING - - - - -	PWA 56556
	HAND PUMP, HYDRAULIC - - - - -	PWA 55380
5	BEARING ASSEMBLY AND GEARBOX BEARING PACKING TRANSFER TUBE - REMOVAL	
	PULLER, GEARBOX BEARING TRANSFER TUBE - - - - -	PWA 55535
		OR
	PULLER, GEARBOX BEARING TRANSFER TUBE - - - - -	PWA 57369
	PUSHER/PULLER, PTO DUPLEX BEARING - - - - -	PWA 56556
	STAND, MAIN GEARBOX - - - - -	PWA 27606
	HAND PUMP, HYDRAULIC - - - - -	PWA 55380
	PIN, ALIGNING, POWER TAKEOFF SHAFT BALL BEARING	
	LINER PACKAGE - - - - -	PWA 50876
	PULLER, MAIN GEARBOX DUPLEX BEARING PLATE - - - - -	PWA 57124
6	GEARBOX SPUR GEARSHAFT AND GEARBOX BEARING HOUSING - REMOVAL	
	PULLER, OIL PUMP DRIVE IDLER SHAFT ROLLER BEARING	
	OUTER RACE - - - - -	PWA 50451

**ILLUSTRATED SUPPORT EQUIPMENT**



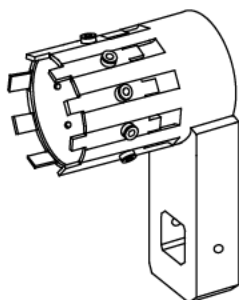
PWA 27606 -C

**Figure T1. PWA 27606 STAND**



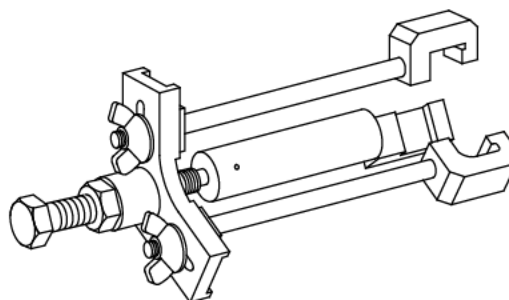
PWA 50406 -C

**Figure T2. PWA 50406 HOLDER**



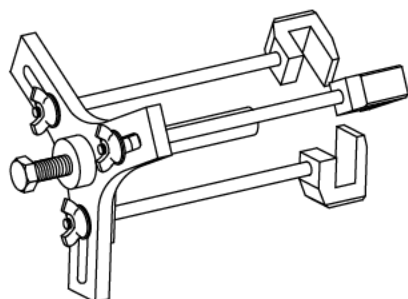
PWA 50407 -C

**Figure T3. PWA 50407 WRENCH**



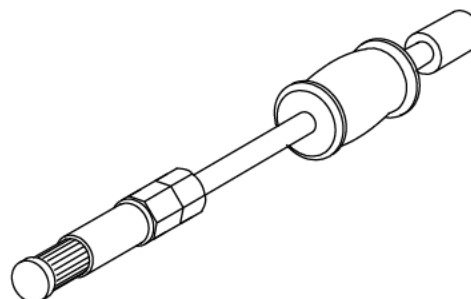
PWA 50409

**Figure T4. PWA 50409 PULLER**



PWA 50410

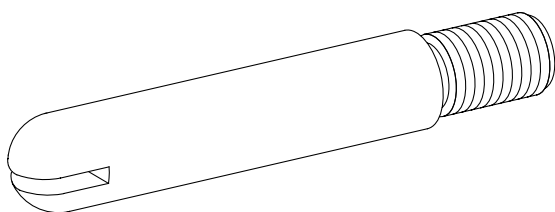
**Figure T5. PWA 50410 PULLER**



GC  
PWA 50451 -C

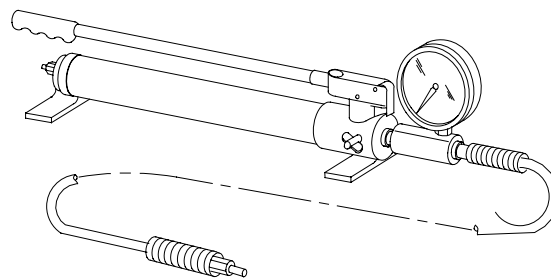
**Figure T6. PWA 50451 PULLER**

ILLUSTRATED SUPPORT EQUIPMENT (continued)



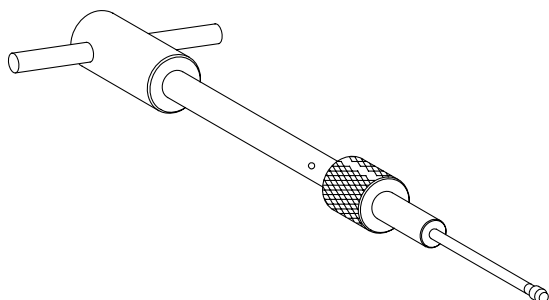
PWA 50876 -C

Figure T7. PWA 50876 PIN



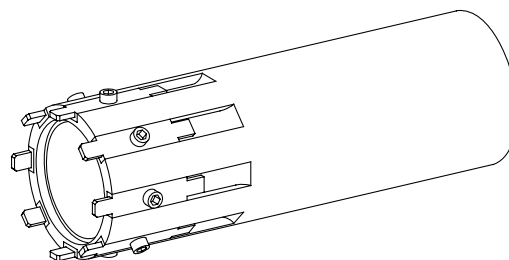
PWA 55380 -C

Figure T8. PWA 55380 HAND PUMP



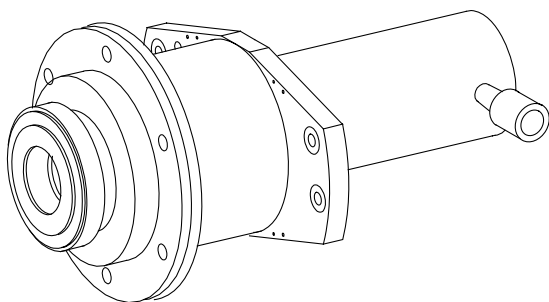
PWA55535 -C

Figure T9. PWA 55535 PULLER



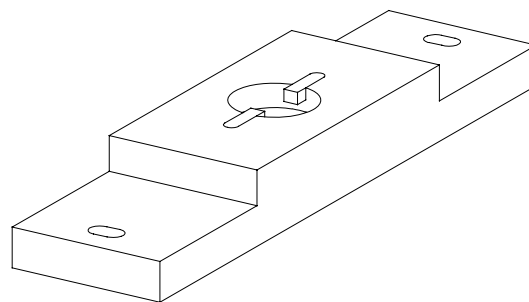
PWA 55824 -C

Figure T10. PWA 55824 WRENCH



PWA 56556 -C

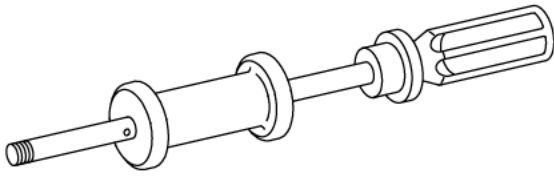
Figure T11. PWA 56556 PUSHER/PULLER



PWA 56685 -C

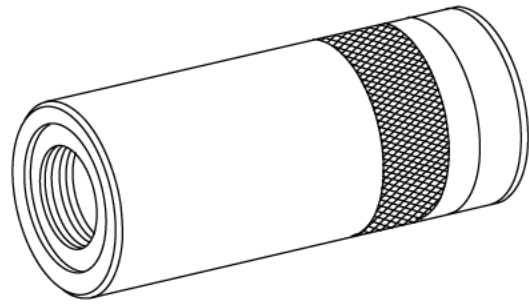
Figure T12. PWA 56685 HOLDER

**ILLUSTRATED SUPPORT EQUIPMENT (continued)**



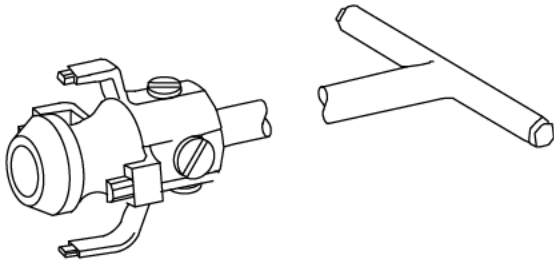
PWA57046 -C

**Figure T13. PWA 57046 PULLER**



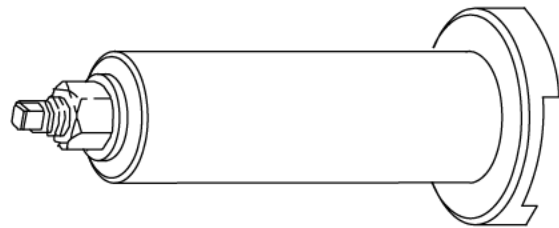
PWA 57105 -C

**Figure T14. PWA 57105 RETAINER**



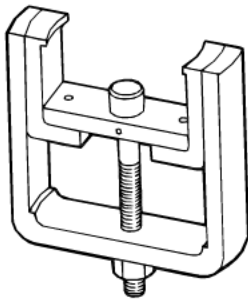
PWA 57108 -C

**Figure T15. PWA 57108 WRENCH**



PWA 57117 -C

**Figure T16. PWA 57117 PULLER**



PWA 57124 -C

**Figure T17. PWA 57124 PULLER**



PWA 57369 -C

**Figure T18. PWA 57369 PULLER**



## 1. INTRODUCTION.

### NOTE

Gearbox rear housing assemblies incorporating PTO gearshaft duplex bearing with two piece split inner race shall be disassembled per WP 014 00.

- a. This subordinate work package contains instructions for removal of gearshaft subassemblies, bearings, and associated parts from gearbox rear housing incorporating PTO gearshaft duplex bearing with one piece inner race.

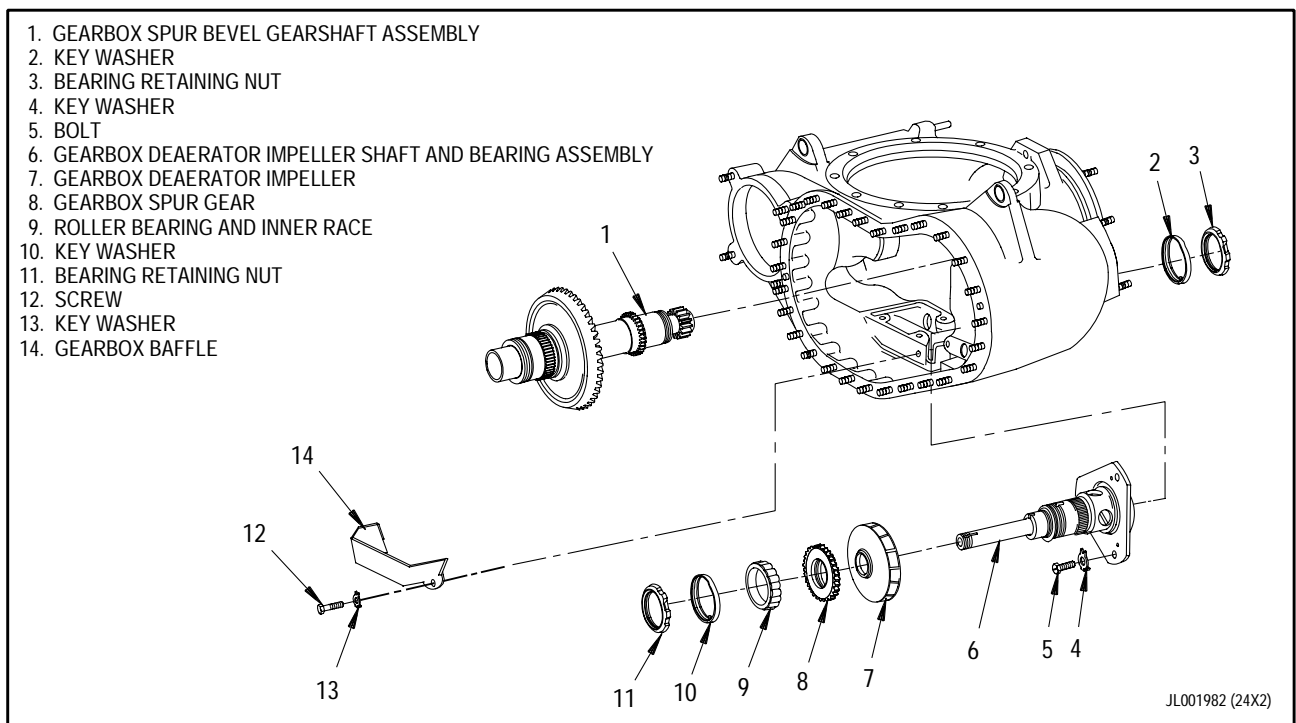
## 2. GEARBOX BAFFLE AND GEARBOX HOUSING BAFFLE - REMOVAL.

(See Figure 1.)

- a. Remove gearbox baffle(14, figure 1) as follows:

(1) Remove screw(12) and key washer(13). Discard key washer.

(2) Lift baffle(14) out of gearbox housing.



**Figure 1. Gearbox Baffle and Gearbox Housing Baffle, Gearbox Impeller Shaft and Bearing Assembly, and Gearbox Spur Bevel Gearshaft Assembly - Removal**

### 3. GEARBOX DEAERATOR IMPELLER SHAFT AND BEARING ASSEMBLY AND GEARBOX SPUR BEVEL GEARSHAFT ASSEMBLY - REMOVAL.

(See figure 1 and Figures 2, 3 and 4.)

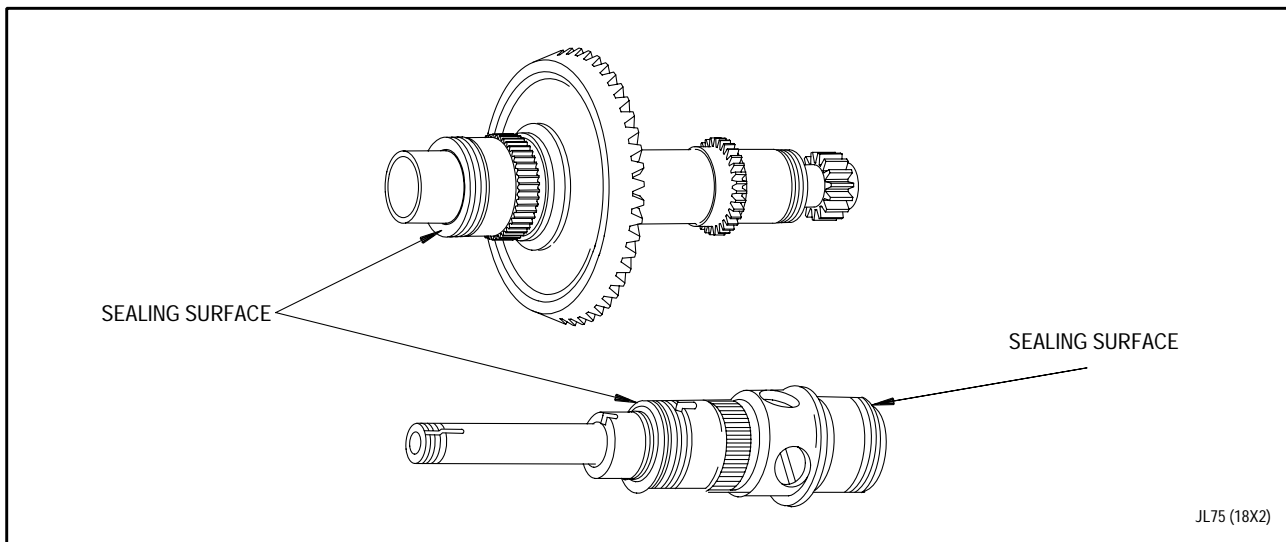
- a. Remove bearing retaining nut(11, figure 1) as follows:



Front surface of shaft serves as seal seat for carbon seal.  
(See figure 2.) Avoid damage to surface.

- (1) Place PWA 50406 holder over end of gearbox deaerator impeller shaft and bearing assembly(6, figure 1), and engage two lugs of holder in two slots on each side of shaft.

- (2) Pilot PWA 50407 wrench over PWA 50406 holder and engage teeth of wrench into bearing retaining nut(11).
- (3) Install two breaker bars onto PWA 50406 holder and PWA 50407 wrench and remove bearing retaining nut(11). Discard key washer(10). Remove tools.



**Figure 2. Gearbox Spur Bevel Gearshaft and Deaerator Impeller Shaft - Sealing Surfaces**

- b. Remove roller bearing and inner race(9) and gearbox spur gear(8) as follows:

- (1) Retract jackscrew detail of PWA 50409 puller.
- (2) Loosen wing nuts of puller jaws and place jaws around gearbox spur gear(8). Tighten wing nuts.
- (3) Using wrench or sliding T-handle, tighten jackscrew and remove gearbox spur gear(8) and roller bearing and inner race(9). Remove tool.
- (4) Preserve bearings or bearing details with engine oil and place them in protective, labeled containers.
- (5) Store roller bearing and inner race(9) in a clean, labeled container.

- c. Remove gearbox deaerator impeller(7) as follows:

- (1) Retract jackscrew detail of PWA 50410 puller.
- (2) Loosen wing nuts of puller jaws and place jaws around gearbox deaerator impeller(7). Tighten wing nuts.
- (3) Using wrench or sliding T-handle, tighten jackscrew and remove gearbox deaerator impeller(7). Remove tool.

- d. Remove gearbox deaerator impeller shaft and bearing assembly(6) from housing as follows:

- (1) Remove bolts(5) and key washers(4). Discard key washers.

- (2) Remove bearing retaining nut(3) as follows:



Use care in following procedure to prevent damaging surface of shaft.

#### NOTE

Rear surface of shaft acts as sealing seat for gearbox breather valve carbon seal.

- (a) Install PWA 56685 holder over end of gearbox deaerator impeller shaft and bearing assembly(6, figure 1) and engage two lugs of holder in two slots on shaft. Secure holder to gearbox housing studs, using gearbox housing hardware. Torque nuts 180 to 230 pound-inches.
- (b) Install PWA 55824 wrench on bearing retaining nut(3).
- (c) Using standard breaker bars, loosen bearing nut(3), using PWA 55824 wrench. Remove PWA 55824 wrench.
- (d) Install PWA 57108 wrench in two slots of bearing retaining nut(3).
- (e) Remove bearing retaining nut(3). Discard key washer(2). Remove tooling.

(3) Thread PWA 57105 retainer(1, figure 3) onto rear of deaerator impeller shaft(3).

(4) Using PWA 57117 puller(2), remove shaft from gearbox housing as follows:

(a) Remove flanged nut detail of PWA 57117 puller(2) and remove housing from puller legs section of tool.

(b) Engage puller legs into holes in deaerator impeller shaft(3).

(c) Slide housing forward until housing contacts wall of gearbox. Install flanged nut.

(d) Pull shaft and bearing from housing by tightening flanged nut while holding square end of threaded detail with wrench.

(e) Remove tooling.



Front surface of shaft acts as sealing seat for carbon seal. (See figure 2). Handle shaft carefully to prevent damage to surface finish.

(f) Store shaft to prevent damage to sealing surfaces.

(g) Preserve bearings or bearing details with lubricating oil and place them in protective, labeled containers.

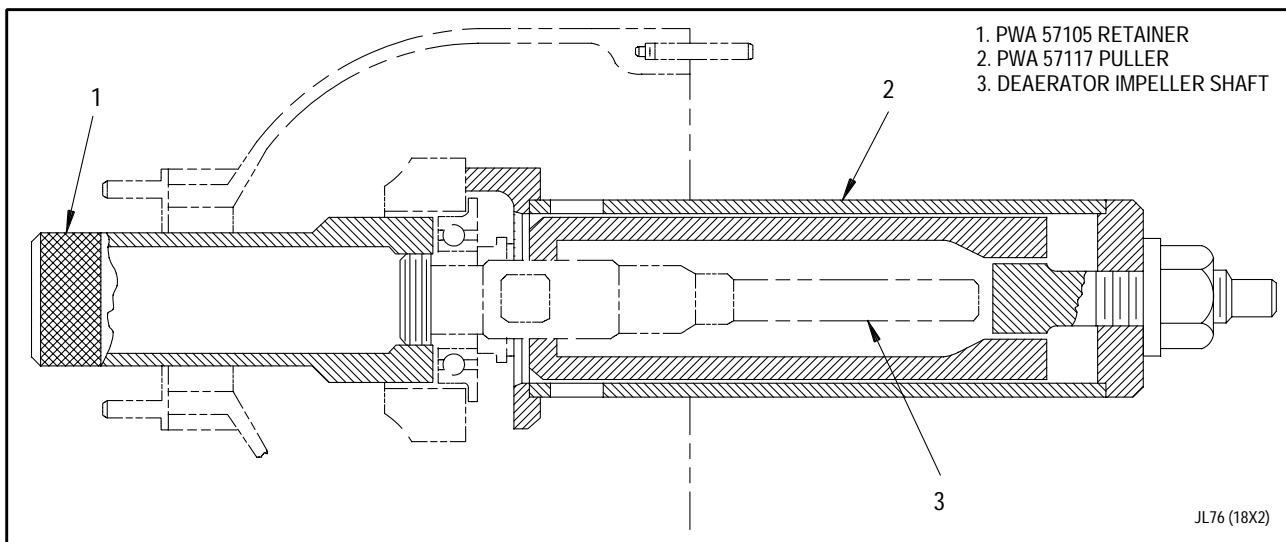


Figure 3. Deaerator Impeller Shaft - Removal

- e. Remove gearbox bearing housing(16, figure 4) and gearbox spur bevel gearshaft(13) as follows:
- (1) Remove adapter(20) from bearing housing(16). Remove and discard packing(19).
  - (2) Remove nuts(17) and bracket(18 or 21).
  - (3) Using PWA 57046 puller, remove bearing housing(16). Remove and discard packing(15).
  - (4) Using mallet and nylon drift, carefully tap (through main oil pump mount pad) gearbox spur gearshaft(13) down to rest on bottom of gearbox.
- f. Remove gearbox (PTO) drive bevel spur gearshaft assembly(1, figure 1) using PWA 56556 pusher/puller details as follows:
- (1) Rotate gearbox so large cavity faces downward.
  - (2) Install PWA 56556 detail-7 jaw set onto duplex bearing ensuring jaws engage bearing inner race puller groove and cutout clears pin in bearing retaining plate.
  - (3) Slide detail-5 ring over OD of jaw set.
  - (4) Install detail-10 ring on rear of gearbox housing.
  - (5) Thread detail-12 knurled nut onto jaw set. Hand tighten to remove all freedom of movement of detail pieces.
  - (6) Install detail-6 adapter onto bevel spur gearshaft, piloting adapter OD inside gearshaft ID.
  - (7) Thread detail-3 hydraulic cylinder into detail-1 base so that round flange of base can be installed on gearbox housing.
  - (8) Install detail-1 base onto gearbox housing ensuring cylinder ram OD pilots into detail-6 adapter ID. Secure base using detail-13 nuts. Torque nuts 30 to 40 pound-inches.
  - (9) Connect PWA 55380 hand pump to hydraulic cylinder.



Gearshaft will be damaged if allowed to fall from housing during removal.

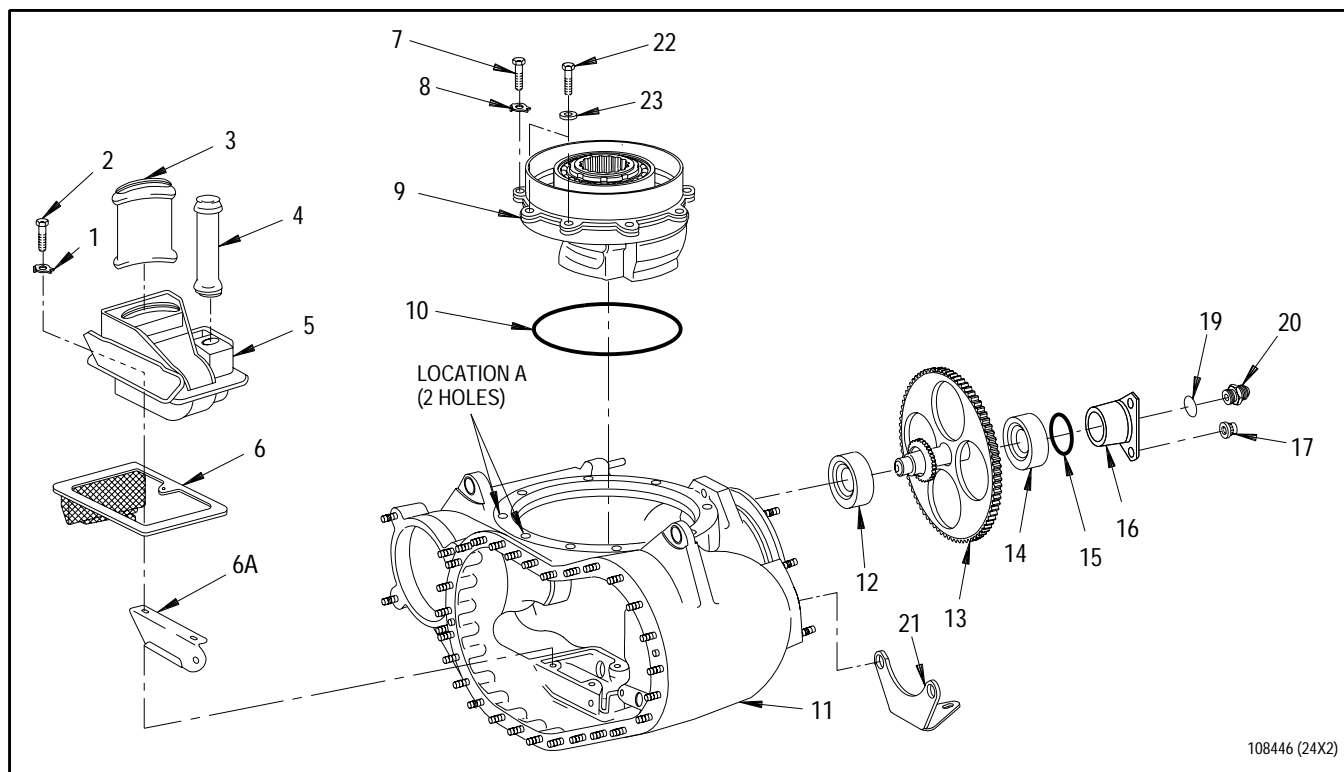
- (10) Actuate hand pump to push gearshaft free of duplex bearing. Manually retain gearshaft or rotate housing so that gearshaft can not fall during removal.
- (11) Remove tooling in reverse order of installation.

**4. GEARBOX BEVEL GEARSHAFT ASSEMBLY,  
GEARBOX SCAVENGE TUBES, AND GEARBOX  
SUMP  
COVER ASSEMBLY - REMOVAL.**

(See Figure 4.)

- a. Remove gearbox (rear) housing(11, figure 4) from PWA 27606 stand and place on work bench.
- b. Remove gearbox bevel gearshaft assembly(9, figure 4), gearbox sump cover assembly(5), and gearbox scavenge tubes(3 and 4) as follows:
  - (1) Deleted.
  - (2) Remove lockwire, bolts(22) and washers(23) from location A. Remove remaining bolts(7) and key washers(8) securing gearshaft assembly(9) to gearbox housing. Discard key washers.

- (3) Pull gearshaft assembly(9) from gearbox housing and remove packing(10). Discard packing.
- (4) Lift gearbox scavenge tubes(3 and 4) from cover assembly(5).
- (5) Remove screws(2) and key washers(1) securing cover assembly(5) and protective screen(6) to gearbox housing. Remove cover assembly(5) and protective screen(6). Discard key washers.
- (6) Remove gearbox housing baffle(6A).



- |                                     |                             |
|-------------------------------------|-----------------------------|
| 1. Key washer                       | 13. Gearbox spur gearshaft  |
| 2. Screw                            | 14. Bearing option          |
| 3. Gearbox scavenge tube            | 15. Packing                 |
| 4. Gearbox scavenge tube            | 16. Gearbox bearing housing |
| 5. Gearbox sump cover assembly      | 17. Nut                     |
| 6. Protection screen                | 18. Deleted                 |
| 6A. Gearbox housing baffle          | 19. Packing                 |
| 7. Bolt                             | 20. Adapter                 |
| 8. Key washer                       | 21. Bracket                 |
| 9. Gearbox bevel gearshaft assembly | 22. Bolt                    |
| 10. Packing                         | 23. Washer                  |
| 11. Gearbox rear housing            |                             |
| 12. Bearing option                  |                             |

**Figure 4. Gearbox Bevel Gearshaft Assembly, Gearbox Sump Cover Assembly, Gearbox Spur Gearshaft Assembly, and Gearbox Scavenge Tubes - Removal**

## 5. BEARING ASSEMBLY AND GEARBOX BEARING PACKING TRANSFER TUBE - REMOVAL.

(See Figures 5 and 6.)

- a. Remove fluid passage bolt(7, figure 5). Discard packing(6).

### NOTE

- There are two configurations of gearbox bearing packing transfer tube(4), internally threaded and unthreaded.
- Comply with step b or c for threaded transfer tube(4), or step d for unthreaded.

- b. Remove threaded gearbox bearing packing transfer tube(4) using PWA 55535 puller as follows:

- (1) Loosen detail-2 knurled pull rod and insert puller into transfer tube(4).
- (2) Tighten detail-2 knurled pull rod. End of detail-1 rod will expand slightly and grip inside of transfer tube.

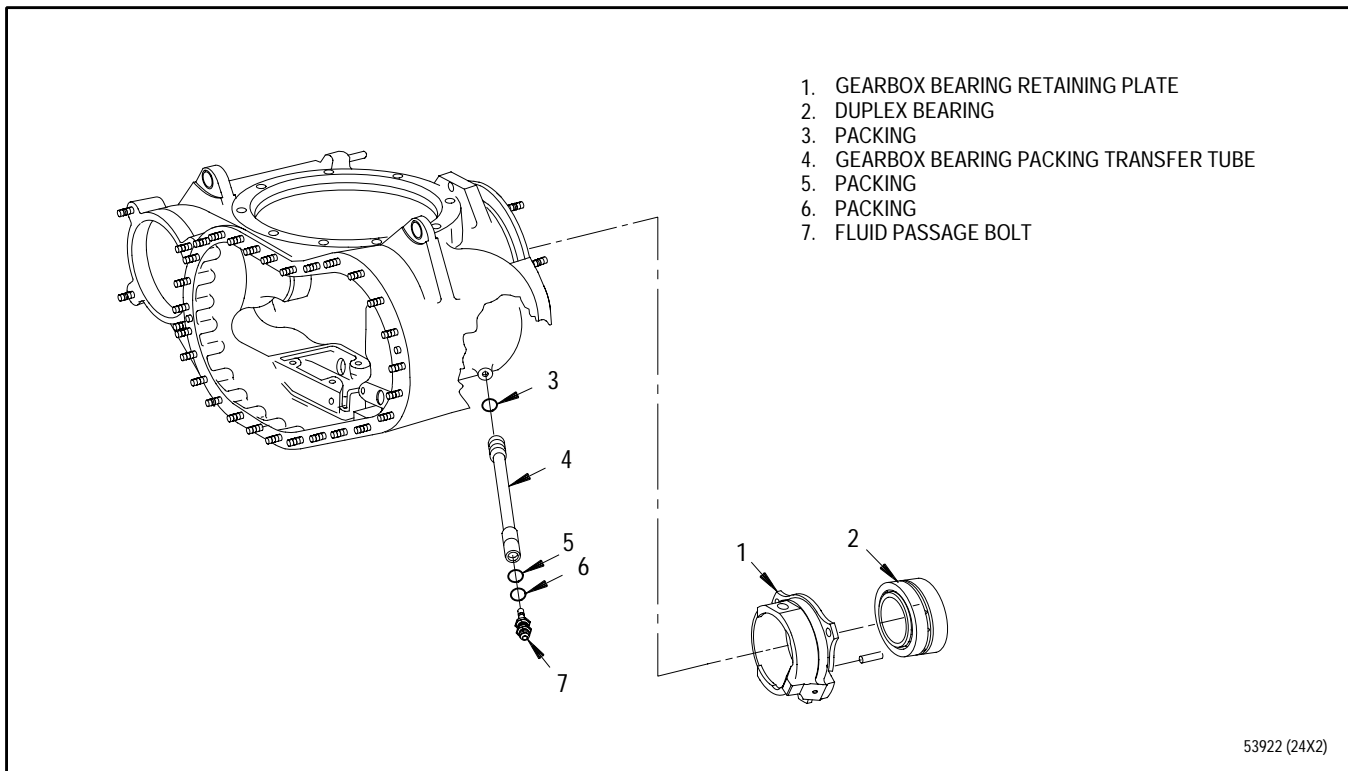


Figure 5. Bearing Assembly and Gearbox Bearing Packing Transfer Tube - Removal



- (3) Pull transfer tube(4) from gearbox housing using PWA 55535 puller.  
(See figure 6.)
- (4) Loosen detail-2 knurled pull rod and remove PWA 55535 puller from transfer tube(4, figure 5).
- c. Remove threaded gearbox bearing packing transfer tube(4) using PWA 57369 puller as follows:
  - (1) Loosen ``T`` handle and detail-2 knurled nut. Insert puller into transfer tube(4) until puller tube assembly detail-1 seats against transfer tube outer end.
  - (2) Tighten detail-2 knurled nut until it contacts gearbox housing, continue tightening with hand pressure or careful use of wrench to loosen transfer tube.
  - (3) Pull transfer tube from gearbox housing using PWA 57369 puller.
  - (4) Loosen knurled nut and ``T`` handle. Remove PWA 57369 puller from transfer tube.
- d. Carefully remove unthreaded gearbox bearing packing transfer tube using mallet and nylon drift. (See figure 6, sheet 2).
- e. Remove and discard packings.
- f. Remove PTO bevel gearshaft duplex bearing(2, figure 5) using PWA 56556 pusher/puller details as follows:
  - (1) Install gearbox housing assembly into PWA 27606 stand.
  - (2) Rotate gearbox housing assembly so that large cavity faces upward.
  - (3) Install PWA 56556 detail-8 adapter through gearbox large cavity, piloting OD of adapter inside ID of bearing retaining plate(1) with adapter pushing against outer race of bearing(2). Notch in adapter will provide clearance around idler gear.
  - (4) Install detail-1 base with oval flange against gearbox housing using detail-13 nuts. Torque nuts 30 to 40 pound-inches.
  - (5) Thread detail-3 hydraulic cylinder into detail-1 base, piloting hydraulic ram OD into detail-8 adapter ID.
  - (6) Rotate gearbox housing assembly so that large cavity faces downward.
  - (7) Connect PWA 55380 hand pump to hydraulic cylinder.
  - (8) Actuate hand pump to push duplex bearing out of gearbox bearing retaining plate.

- (9) Remove and discard bearing.
- (10) Remove tooling in reverse order of installation.
- g. Remove gearbox bearing retaining plate(1) as follows:
  - (1) Install PWA 50876 pins to prevent cocking retaining plate(1) during removal.
  - (2) Install PWA 57124 retaining plate puller by retracting puller nut detail, and positioning jaws into puller slot at lower end of retaining plate(1). Position outer leg details on gearbox housing.
  - (3) Using wrench, activate jackscrew to remove retaining plate(1).
  - (4) Remove PWA 57124 retaining plate puller and PWA 50876 pins.

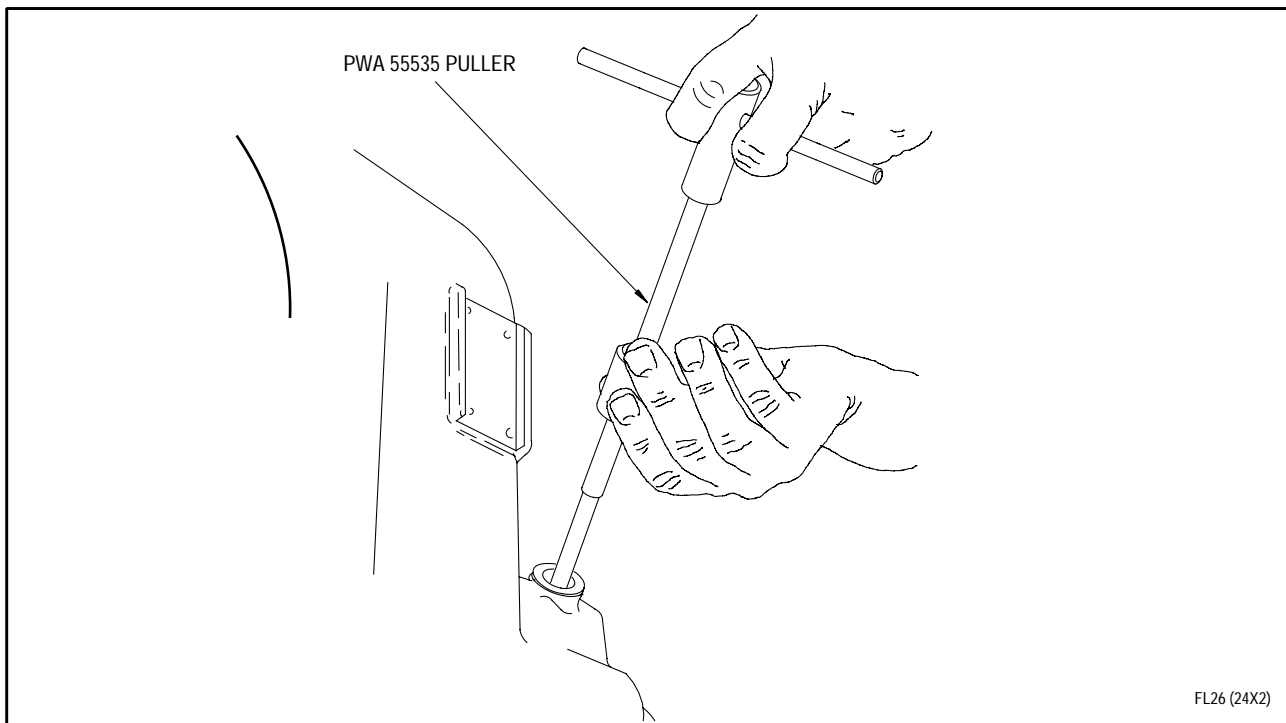
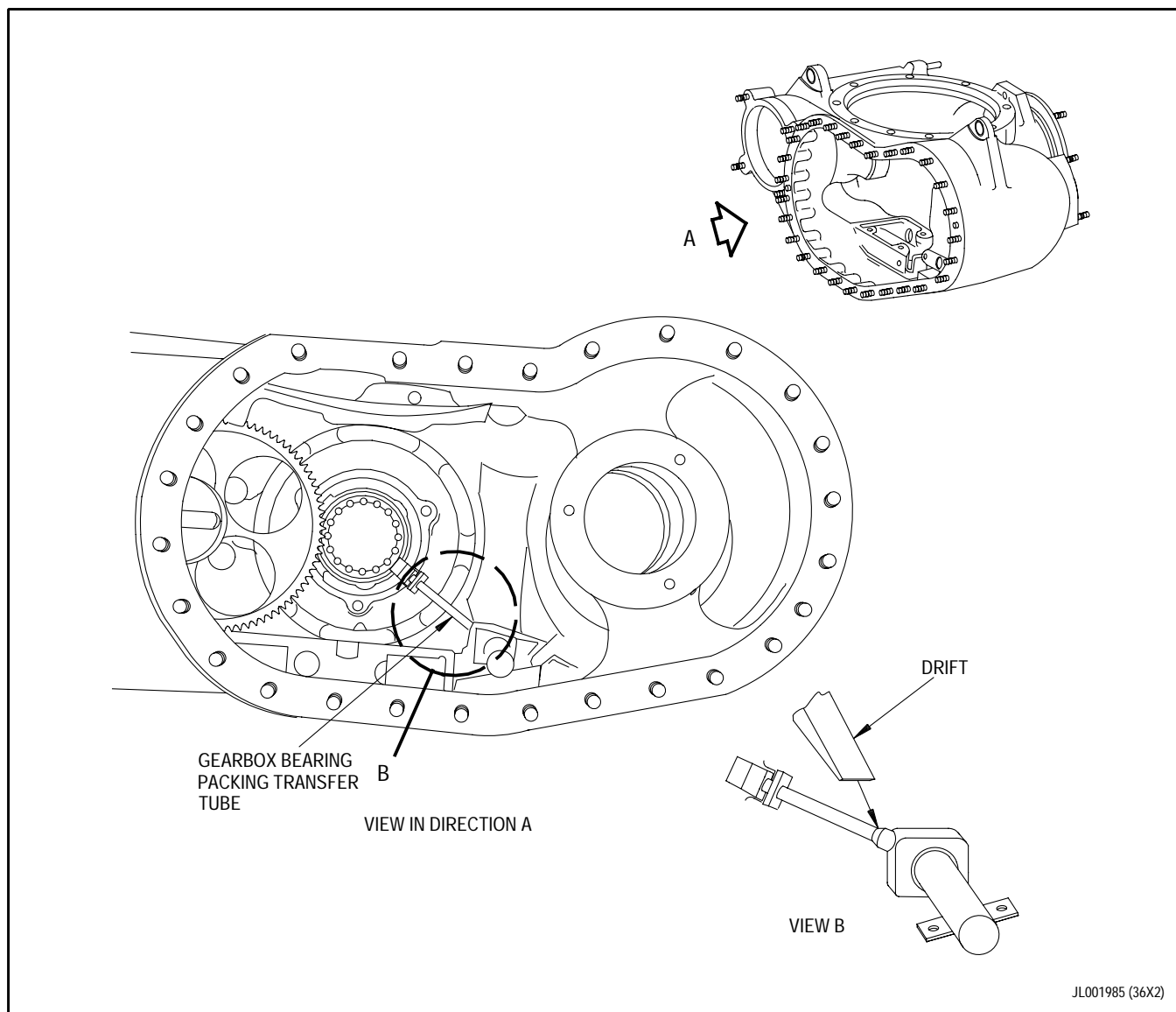


Figure 6. Gearbox Bearing Packing Transfer Tube - Removal (Sheet 1 of 2)



**Figure 6. Gearbox Bearing Packing Transfer Tube - Removal (Sheet 2 of 2)**

**6. GEARBOX SPUR GEARSHAFT AND  
GEARBOX BEARING HOUSING - REMOVAL.**

(See figure 4.)

- a. Remove gearbox spur gearshaft(13) and bearing options(12 and 14) by lifting it from outer race of roller bearing, then cocking it sideways.

- b. Remove outer race of roller bearing option(12) from housing as follows:

- (1) With collet of PWA 50451 puller in free position, insert collet through housing and through bearing.

- (2) Ensure collet is properly in place. Expand collet by holding lower wrench flats while tightening upper wrench flats.

- (3) Ensure puller lip on collet engages end face rather than raceway. Remove race from housing using knocker action.

- (4) Discard bearing.

## 7. GEARBOX BEARING (OIL) NOZZLE - REMOVAL.

(See Figure 7.)

a. Remove oil nozzle from gearbox rear housing as follows:

(1) Remove screws(3) and key washers(2). Discard key washers.

(2) Remove gearbox bearing (oil) nozzle(1) and packing(4). Discard packing.

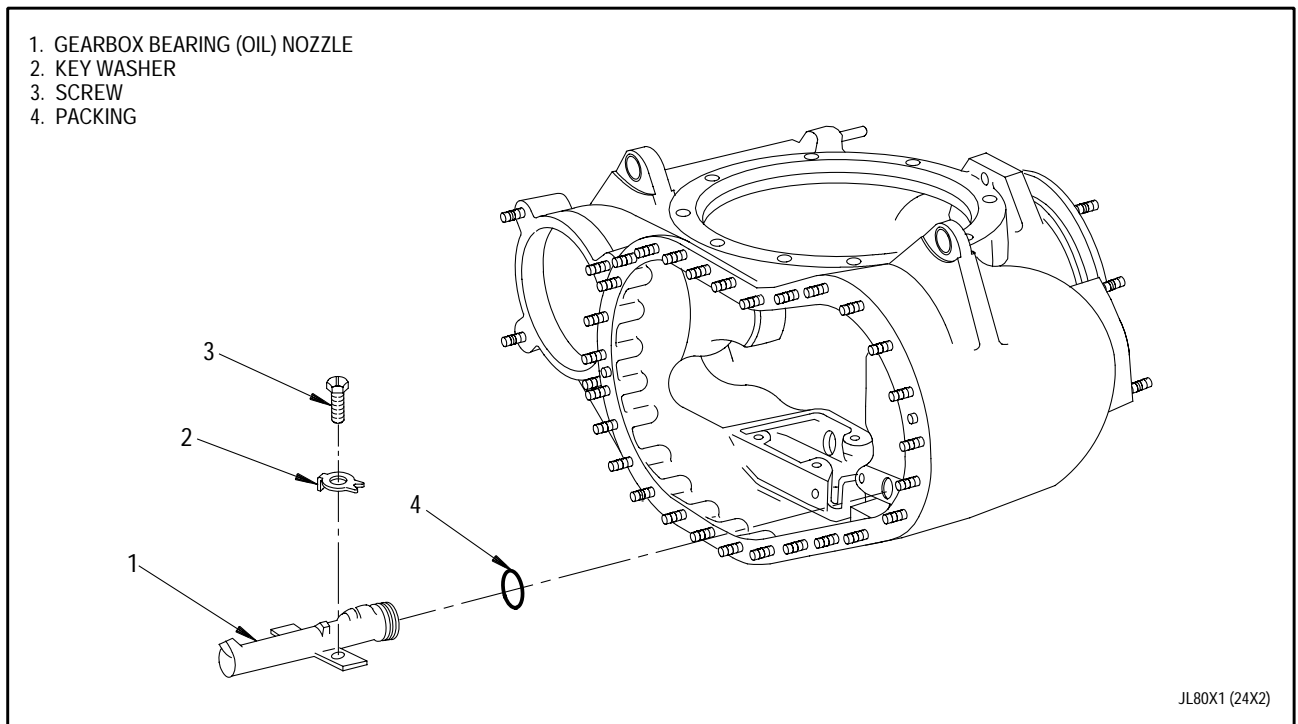


Figure 7. Gearbox Bearing (Oil) Nozzle - Removal



# WORK PACKAGE

## INTRODUCTION

### GEARBOX MODULE - DISASSEMBLY OF SUBASSEMBLIES

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2					0

**1. INTRODUCTION.**

This work package introduces the 020 00 through 199 00 series of work packages for the gearbox module - disassembly of subassemblies. The following work packages are included in this series.

<b>WP No.</b>	<b>Title</b>
021 00	Seal Assemblies, Face - Removal From Retainers
022 00	Shaft and Bearing Assembly, Gearbox Deaerator Impeller - Disassembly
023 00	Gearshaft Assembly, Bevel, Spur, Gearbox Drive - Disassembly
024 00	Bearing Assembly (Spur Bevel Gearshaft) - Disassembly
025 00	Gearshaft, Spur, Gearbox - Disassembly
026 00	Gearbox Spur Gear and Gearbox Idler Gear (Stub) Assembly - Disassembly
027 00	Gearbox Bevel Gearshaft Assembly - Disassembly
028 00	Reduction Gearbox Assembly - Disassembly
029 00	Seal Assembly, Face (Deaerator Impeller Shaft) - Disassembly
030 00	Seal Assembly, Face (Spur Bevel Driveshaft) - Disassembly
031 00 through 199 00	Open



**WORK PACKAGE****TECHNICAL PROCEDURES****SEAL ASSEMBLIES, FACE -****REMOVAL FROM RETAINERS****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 6

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 5 . . . . .					
6 Blank . . . . .					

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O. 2-1-111

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

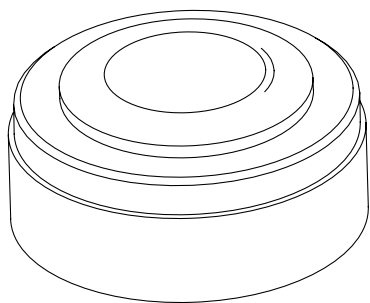
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

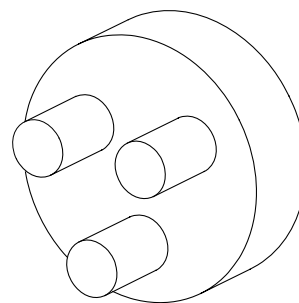
Paragraph	Function - Tool Nomenclature	Tool Number
2	Face Seal Assemblies - Removal from seal retainer	
	Base, Deaerator impeller shaft seal - - - - -	PWA 50418
	Drift, Deaerator impeller shaft seal - - - - -	PWA 50420
	Base, Driveshaft seal - - - - -	PWA 50442
	Drift, Driveshaft seal - - - - -	PWA 50443

ILLUSTRATED SUPPORT EQUIPMENT



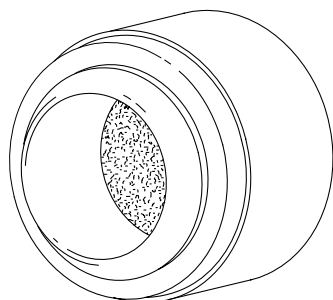
PWA 50418 -C

**Figure T1. PWA 50418 Base**



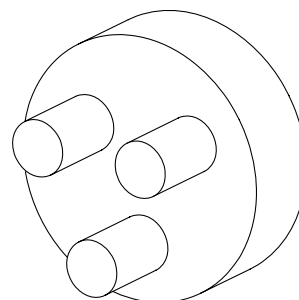
PWA 50420 -C

**Figure T2. PWA 50420 Drift**



PWA 50442 -C

**Figure T3. PWA 50442 Base**



PWA 50443 -C

**Figure T4. PWA 50443 Drift**

**1. INTRODUCTION.**

- a. This work package contains instructions for removing face seal assemblies from seal retainers.

**2. FACE SEAL ASSEMBLIES - REMOVAL FROM SEAL RETAINERS.**

(See Figure 1, and Table 1.)

**NOTE**

Each seal assembly may be removed from retainer using following procedure and tools in table 1.

- a. Place seal and retainer on proper base. (See figure 1.)

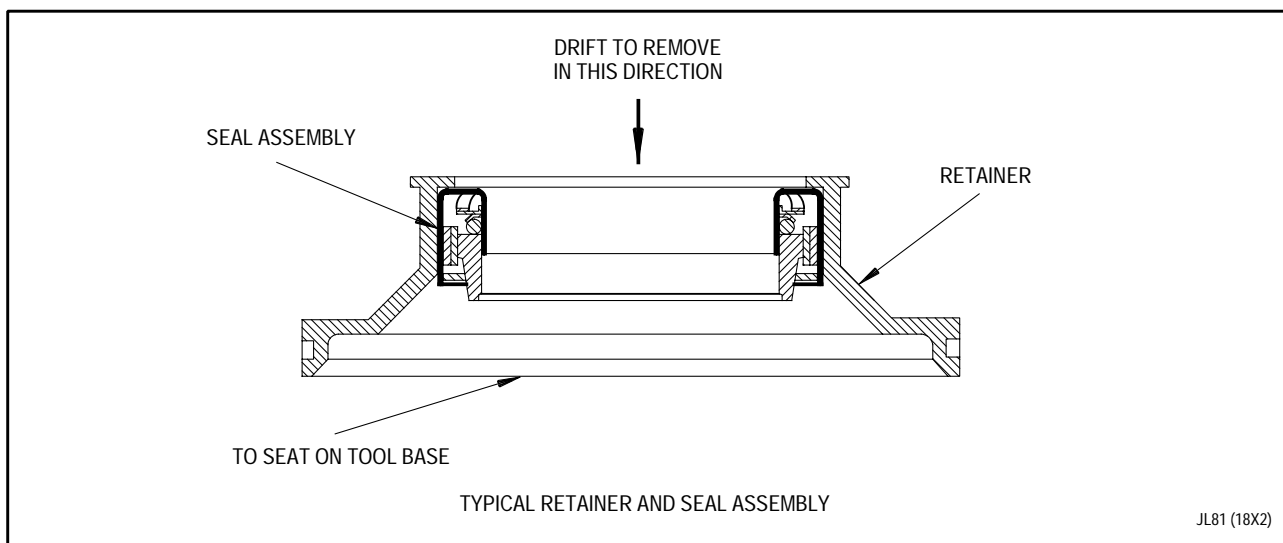
**Table 1. Seal Removal Tools**

Seal Nomenclature	Base	Drift
Deaerator impeller shaft	PWA 50418	PWA 50420
Spur bevel gearshaft	PWA 50442	PWA 50443

- b. Using proper drift and arbor press, press seal from retainer.  
(See table 1.)
- c. Store seal separately as it is easily damaged. Refer to T.O. 2-1-111.

**NOTE**

Seal assembly will be inspected as assembled unit. Further disassembly may be directed at that time.



**Figure 1. Removal of Seal Assembly From Retainer**



**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**SHAFT AND BEARING ASSEMBLY, GEARBOX DEAERATOR IMPELLER -**

**DISASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 4

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 4 . . . . .					0

## REFERENCE MATERIAL REQUIRED

## Title

Standard Maintenance Procedures - - - - -

## Number

T.O. 2-1-111

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

## Nomenclature

## Specification/Vendor Part Number

Gloves, Nylon lint-free

Style No. 4312

Oil, lubricating

MIL-L-7808

## EXPENDABLE ITEMS

None

## APPLICABLE SUPPORT EQUIPMENT

## Paragraph

## Function - Tool Nomenclature

## Tool Number

2

Deaerator Impeller Shaft and Bearing  
Assembly - DisassemblyBase, Deaerator impeller shaft from ball  
bearing - - - - -

PWA 50413

Split Plate, Deaerator impeller shaft  
from ball bearing - - - - -

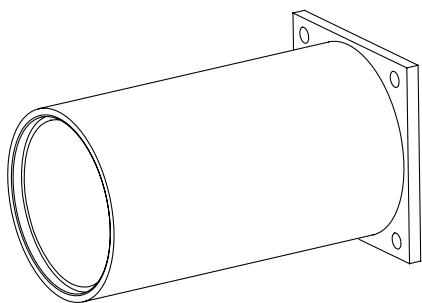
PWA 50414

Drift, Deaerator impeller shaft from  
ball bearing - - - - -

PWA 50415

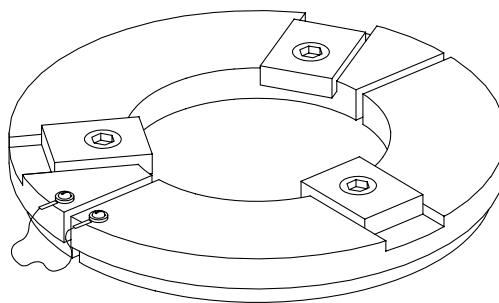


**ILLUSTRATED SUPPORT EQUIPMENT**



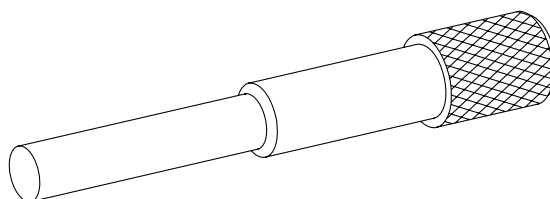
PWA50413 -C

**Figure T1. PWA 50413 Base**



PWA50414 -C

**Figure T2. PWA 50414 Split Plate**



PWA50415 -C

**Figure T3. PWA 50415 Drift**

## 1. INTRODUCTION.

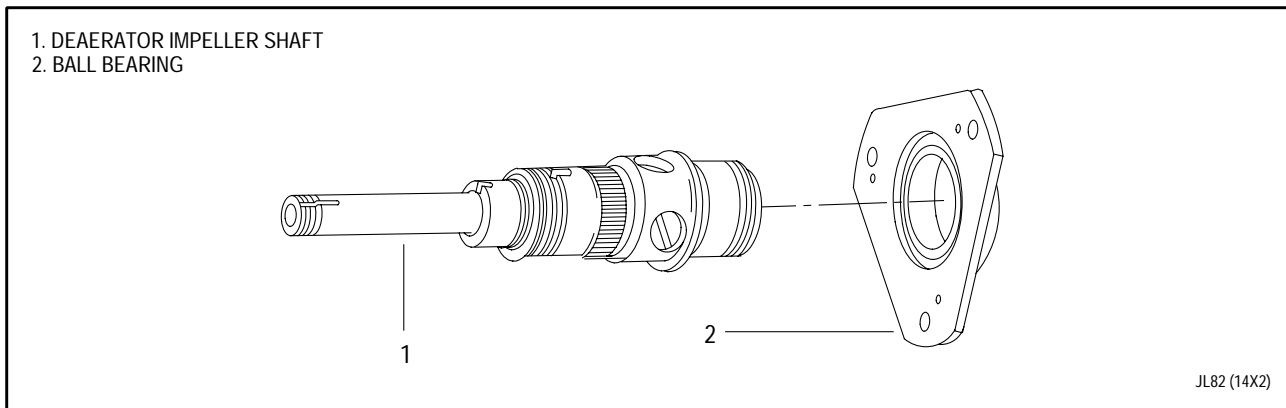
- a. This work package contains instructions for disassembly of the deaerator impeller shaft and bearing assembly.

## 2. DEAERATOR IMPELLER SHAFT AND BEARING ASSEMBLY - DISASSEMBLY.

(See Figure 1.)

- a. With bearing end of shaft up, position PWA 50414 split plate, key details up, directly under bearing so key details of tool contact flats of shaft. (See figure 1.)

- b. Position tool and shaft in PWA 50413 base.
- c. Using PWA 50415 drift and standard arbor press, press shaft from bearing.
- d. Preserve bearings or bearing details with engine oil and place in protective, labeled containers.
- e. Store bearing in clean, suitable, labeled container.



**Figure 1. Deaerator Impeller Shaft and Bearing Assembly - Disassembly**

# WORK PACKAGE

## TECHNICAL PROCEDURES

GEARSHAFT ASSEMBLY, BEVEL, SPUR, GEARBOX DRIVE -

## DISASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 5 . . . . .	0				
6 Blank . . . . .	0				

## REFERENCE MATERIAL REQUIRED

## Title

Standard Maintenance Procedures - - - - -

## Number

T.O. 2-1-111

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

## Nomenclature

## Specification/Vendor Part Number

Gloves, Nylon lint-free

Style No. 4312

Oil, lubricating

MIL-L-7808

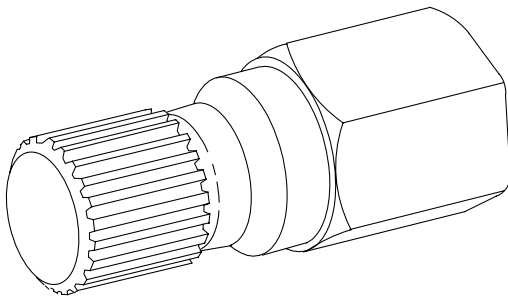
## EXPENDABLE ITEMS

None

## APPLICABLE SUPPORT EQUIPMENT

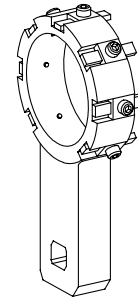
Paragraph	Function - Tool Nomenclature	Tool Number
2	Gearbox (PTO) Drive Spur Bevel Gearshaft Assembly - Disassembly	
	Holder, gearshaft - - - - -	PWA 50433
	Wrench, gearshaft roller bearing inner race retaining nut - - - - -	PWA 50434
	Puller, gearshaft roller bearing inner race and gear - - - - -	PWA 50439
	Base, gearshaft - - - - -	PWA 57043
	Puller, Bevel gearshaft drive bearing inner races - - - - -	PWA 57050

ILLUSTRATED SUPPORT EQUIPMENT



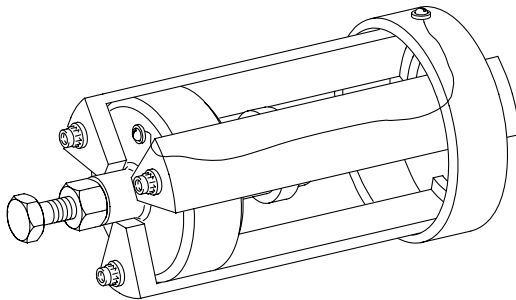
PWA 50433 -C

**Figure T1. PWA 50433 Holder**



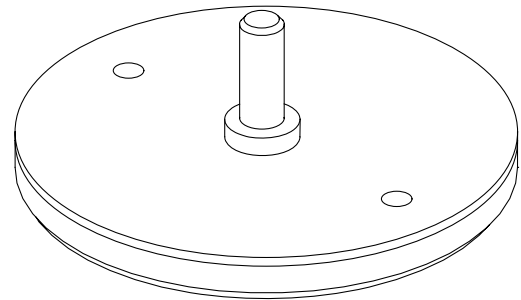
PWA 50434 -C

**Figure T2. PWA 50434 Wrench**



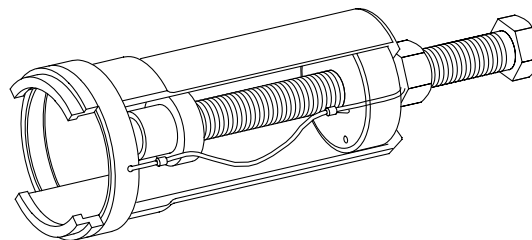
PWA50439 -C

**Figure T3. PWA 50439 Puller**



PWA 57043 -C

**Figure T4. PWA 57043 Base**



PWA 57050 -C

**Figure T5. PWA 57050 Puller**

**1. INTRODUCTION.**

- a. This work package contains instructions for disassembly of the gearbox drive spur bevel gearshaft assembly.

**2. GEARBOX SPUR BEVEL GEARSHAFT ASSEMBLY - DISASSEMBLY.**

(See Figure 1.)

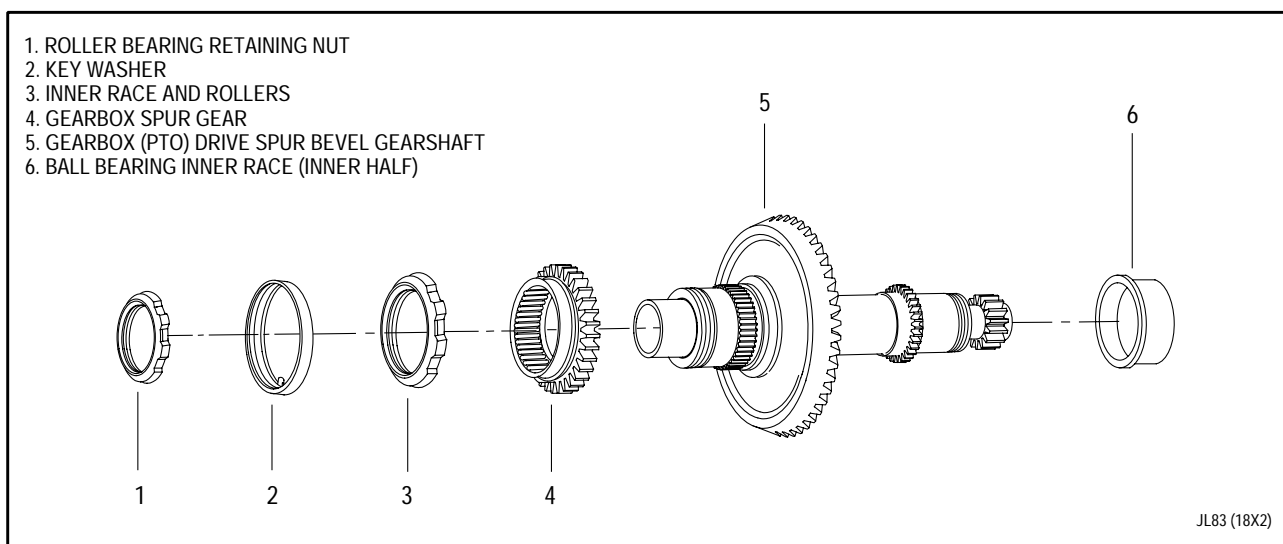
- a. Remove front ball bearing inner race (inner half)(6, figure 1) from gearshaft as follows:
  - (1) Secure PWA 50433 holder, spline end up, in bench vise or equivalent.
  - (2) Retract jackscrew detail of PWA 57050 puller.
  - (3) Position pilot detail of puller in gearshaft bore.
  - (4) Adjust puller jaws to engage inner race(6) puller groove, and secure jaws using ring detail.
  - (5) Using standard wrench, tighten jackscrew to remove inner race(6).

- b. Remove roller bearing retaining nut(1) as follows:

- (1) Secure PWA 50433 holder, spline end up, in bench vise or equivalent.
- (2) Place PWA 50434 wrench, teeth up, over holder.
- (3) Unbend key washer and install gearshaft, retaining nut down, onto splines of holder and engage teeth of wrench into slots in nuts.
- (4) Using standard breaker bar engage wrench and remove nut. Remove and discard key washers.

- c. Remove roller bearing inner race and rollers(3) and spur gear(4) in one operation as follows:

- (1) Install gearshaft(5) in PWA 57043 base.
- (2) Retract jackscrew detail of PWA 50439 puller.



**Figure 1. Gearbox Drive Spur Bevel Gearshaft - Disassembly**

- (3) With gearshaft in PWA 57043 base, slip puller legs over bearing details and over puller ring of gear and slide locking ring to secure legs to puller ring.
- (4) Hold hex-head of puller disk while tightening jackscrew until pilot seats in gearshaft. Using standard wrenches tighten jackscrew while holding hex-head of puller disk to remove bearing details and gear.
- (5) Preserve bearings or bearing details with engine oil and place them in protective, labeled containers.
- (6) Store bearing details in same container as details already removed.





# WORK PACKAGE

## TECHNICAL PROCEDURES

### BEARING ASSEMBLY (SPUR BEVEL GEARSHAFT) -

### DISASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
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					12

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures	T.O. 2-1-111

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Gloves, Nylon lint-free	Style No. 4312
Oil, lubricating	MIL-L-7808

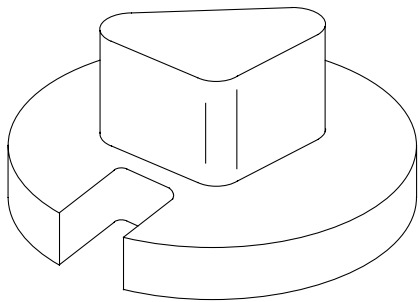
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

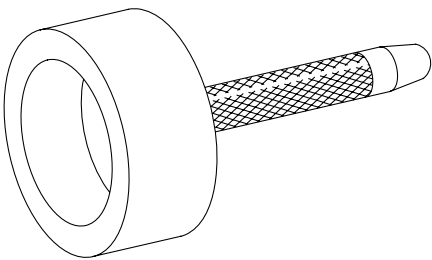
Paragraph	Function - Tool Nomenclature	Tool Number
2	Bearing Assembly (Spur Bevel Gearshaft) - Disassembly	
	Base, PTO ball bearing retaining plate from bearing race	PWA 56504 or SAALC X9053732
	Drift, PTO ball bearing retaining plate from bearing race	PWA 50661

ILLUSTRATED SUPPORT EQUIPMENT



SAALC X9053732 -C

Figure T1. PWA 56504 Base



PWA50661 -C

Figure T2. PWA 50661 Drift

## 1. INTRODUCTION.

- a. This work package contains instructions for disassembly of the bearing assembly (spur bevel gearshaft).

## 2. BEARING ASSEMBLY (SPUR BEVEL GEARSHAFT) - DISASSEMBLY.

(See Figures 1 and 2.)

### NOTE

Bearing retaining plates(1 and 3, figure 1) are usually completely disassembled when removed from gearbox housing;

however, the outer race(2) can require special disassembly from plate(1) using this procedure.

- a. Remove bearing outer race(2, figure 1) from retaining plate(1) as follows:
  - (1) Position retaining plate(3, figure 2) on PWA 56504 base, with flange up, so triangular portion of base passes through scallops in retaining plate and rests on bearing race(2).

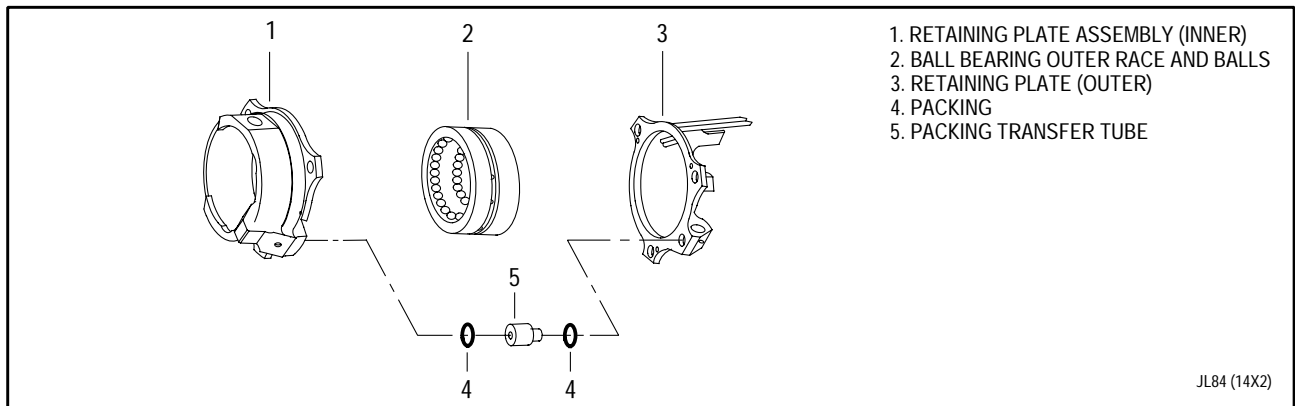
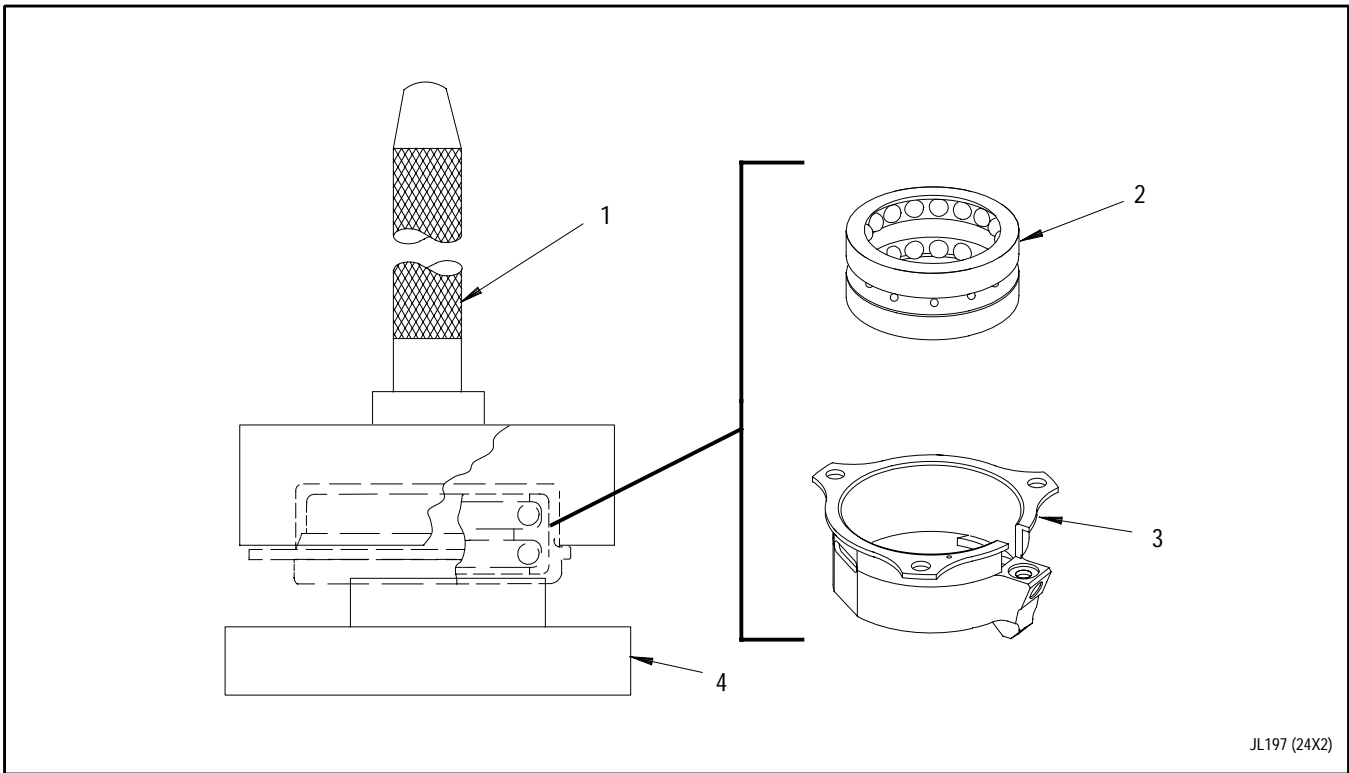


Figure 1. Bearing Assembly (Spur Bevel Gearshaft) - Disassembly

(2) Pilot PWA 50661 drift on flange of retaining plate(3).

(3) Using mallet, drift retaining plate(3) from race(2).



JL197 (24X2)

### Legend for figure

1. PWA 50661 drift
2. Bearing outer race
3. Bearing retaining plate (inner)
4. PWA 56504 base

### Figure 2. Duplex Ball Bearing - Removal From Inner Retaining Plate

(4) Preserve bearings or bearing details with engine oil and place them in protective, labeled containers.

(5) Store bearing outer race with previously removed

inner race. Take appropriate precautions to protect details from damaging each other.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARSHAFT, SPUR, GEARBOX -

### DISASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 . . . . .	14	4 . . . . .	14	5 . . . . .	0
2 - 3 . . . . .	0			6 Blank . . . . .	14

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O. 2-1-111

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Gloves, Nylon lint-free	Style No. 4312
Oil, lubricating	MIL-L-7808

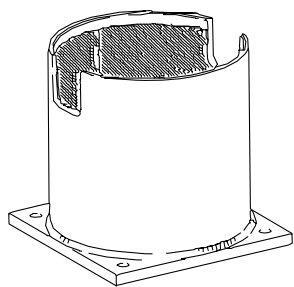
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

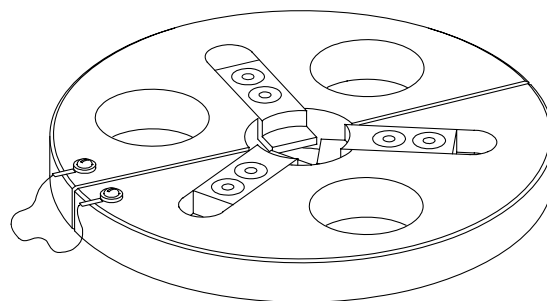
Paragraph	Function - Tool Nomenclature	Tool Number
2	Gearbox Spur Gearshaft - Disassembly	
	Base, Bearing removal - - - - -	PWA 7368
	Split Plate, Oil pump drive idler	
	gearshaft roller and ball bearing	
	removal - - - - -	PWA 50449
	Drift, Oil pump drive idler gearshaft	
	roller and ball bearing removal - - - -	PWA 50450

ILLUSTRATED SUPPORT EQUIPMENT



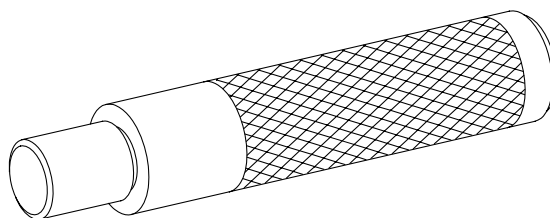
PWA 7368 -C

**Figure T1. PWA 7368 Base**



PWA50449 -C

**Figure T2. PWA 50449 Split Plate**



PWA50450 -C

**Figure T3. PWA 50450 Drift**

**1. INTRODUCTION.**

- a. This work package contains instructions for disassembly of gearbox spur (oil pump drive idler) gearshaft assembly.

**2. GEARBOX SPUR GEARSHAFT - DISASSEMBLY.**

(See Figure 1.)

- a. Remove ball bearing(3, figure 1) as follows:

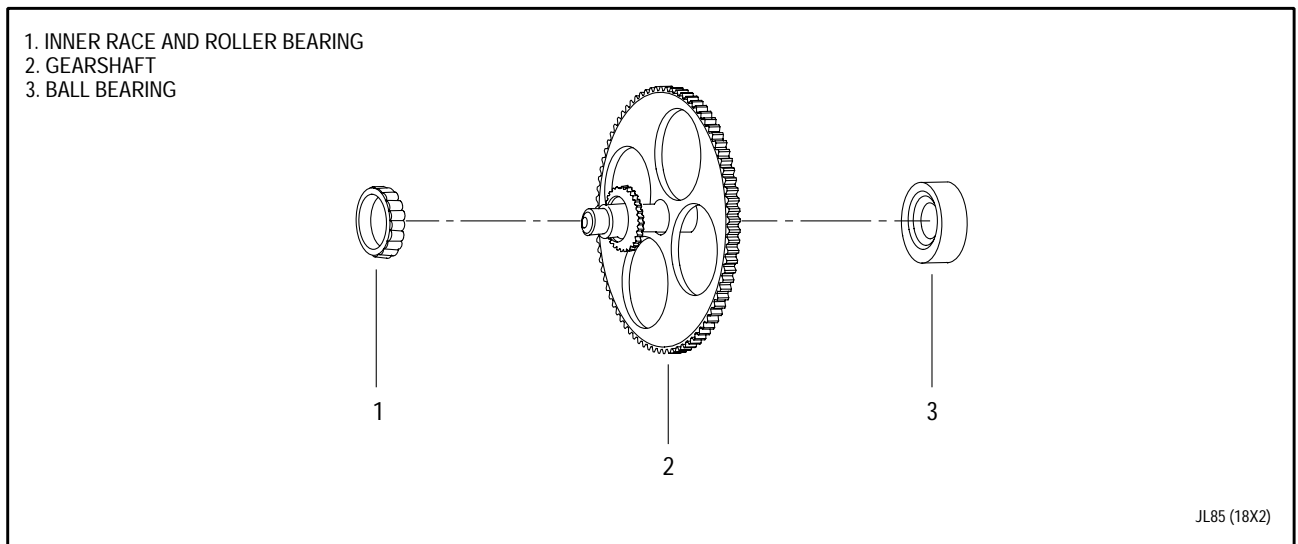
- (1) Install PWA 50449 split plate under inner race of ball bearing(3) so fingers of tool mesh with flats of gearshaft.
- (2) Install plate and gearshaft in PWA 7368 base.
- (3) Use PWA 50450 drift and standard arbor press to press shaft(2) from ball bearing(3).

- b. Remove roller bearing(1) as follows:

- (1) Turn gearshaft(2) over, leaving roller bearing(1) on top.
- (2) Install PWA 50449 split plate under inner race of roller bearing(1), so fingers of tool mesh with flats of gearshaft.
- (3) Install plate and gearshaft in PWA 7368 base.
- (4) Press shaft(2) from roller bearing(1) using PWA 50450 drift and standard arbor press.

- c. Discard ball bearing and roller bearing.





**Figure 1. Gearbox Spur Gearshaft - Disassembly**



# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARBOX SPUR GEAR AND GEARBOX IDLER GEAR SHAFT ASSEMBLY -

### DISASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 5 . . . . .	0				
6 Blank . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O. 2-1-111

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Gloves, Nylon lint-free	Style No. 4312
Oil, lubricating	MIL-L-7808

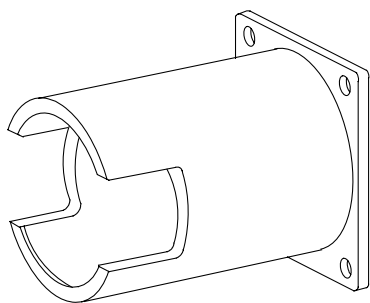
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

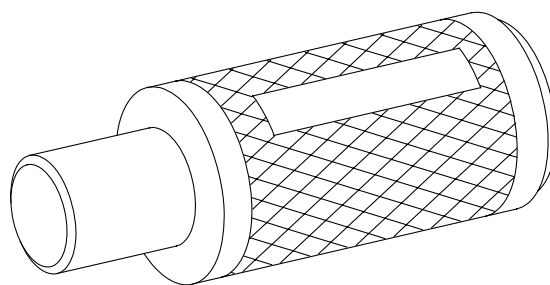
Paragraph	Function - Tool Nomenclature	Tool Number
2	Gearbox Spur Gear and Gearbox Idler Gearshaft Assembly - Disassembly	
	Base, Bearing removal - - - - -	PWA 6660
	Drift, Idler stub shaft - - - - -	PWA 50428
	Base, Idler stub shaftgear roller bearing - - - - -	PWA 50429
	Split Plate - Idler stub shaft from roller bearing and gear - - - - -	PWA 50632
	Drift, Idler stub shaftgear roller bearing outer race - - - - -	PWA 50640

ILLUSTRATED SUPPORT EQUIPMENT



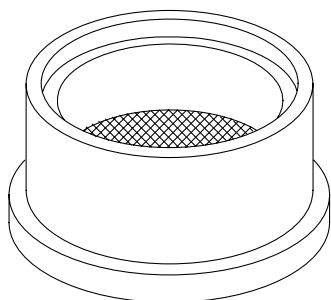
PWA 6660 -C

**Figure T1. PWA 6660 Base**



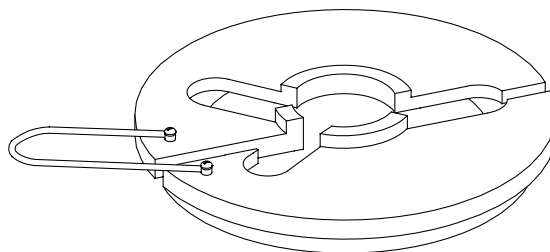
PWA 50428 -C

**Figure T2. PWA 50428 Drift**



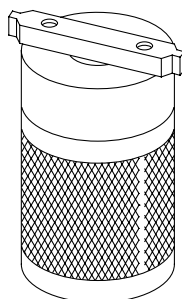
PWA 50429 -C

**Figure T3. PWA 50429 Base**



PWA50632 -C

**Figure T4. PWA 50632 Split Plate**



PWA 50640 -C

**Figure T5. PWA 50640 Drift**

## 1. INTRODUCTION.

- a. This work package contains instructions for disassembly of the gearbox spur gear and gearbox idler gearshaft assembly.

## 2. GEARBOX SPUR GEAR AND GEARBOX IDLER GEARSHAFT ASSEMBLY - DISASSEMBLY.

(See Figure 1.)

- a. Remove gear and bearing from shaft(1, figure 1) as follows:
  - (1) Position PWA 50632 split plate under bearing while clearing trapped bolts.
  - (2) Position plate and shaft assembly in PWA 6660 base.
  - (3) Using PWA 50428 drift and standard arbor press, press shaft from gear and bearing. Remove tools.
  - (4) Remove both sections(2) and (7), of split inner races, preserve with engine oil and store in clean, suitable, labeled container.

- (5) Remove previously captive bolts(3), from flange of shaft(1).

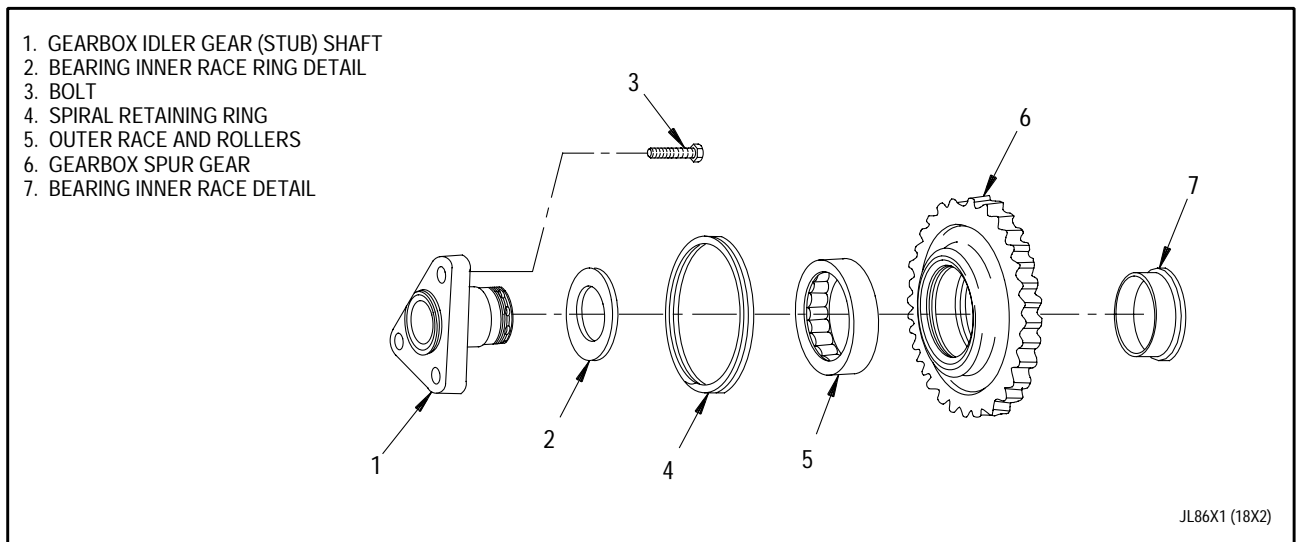
- b. Remove bearing outer race and rollers(5) from gear as follows:

- (1) Remove spiral retaining ring(4).
- (2) Place gear, large OD down, on PWA 50429 base.
- (3) Using PWA 50640 drift and standard arbor press, press bearing from gear.



Details of bearing shall be stored only with details of that bearing.

- (4) Preserve bearings or bearing details with engine oil. Store outer race and rollers with details of this bearing previously removed.



**Figure 1. Gearbox Spur Gear and Gearbox Idler Gear Shaft - Disassembly**





# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARBOX BEVEL GEARSHAFT ASSEMBLY -

### DISASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 10

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 10	.	.	.	.	0

## REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O. 2-1-111

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Gloves, Nylon lint-free	Style No. 4312
Oil, lubricating	MIL-L-7808

## EXPENDABLE ITEMS

None

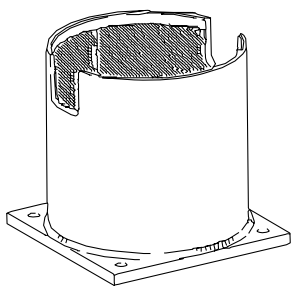
## APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	Gearbox Bevel Gearshaft Assembly - Disassembly	
	Base, Bearing removal - - - - -	PWA 7368
	Adapter, Various bases holding - - - - -	PWA 21500
	Holder, gear housing - - - - -	PWA 50454
	Wrench, ball bearing outer race nut - -	PWA 50455
	Wrench, gear roller bearing inner race retaining nut - - - - -	PWA 50459
	Wrench, gear ball bearing inner race nut	PWA 50460
	Drift, gear roller bearing outer race	PWA 50461
	Base, gear roller bearing outer race -	PWA 50462
	Base, housing ball bearing outer race	PWA 50463
	Holder, gear and sleeve subassembly - -	PWA 50465
	Drift, gear ball bearing inner race - -	PWA 50467
	Split Plate, gear roller bearing inner race - - - - -	PWA 50468

## APPLICABLE SUPPORT EQUIPMENT

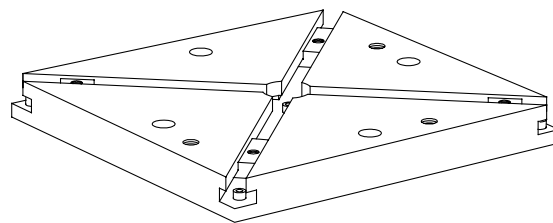
Paragraph	Function - Tool Nomenclature	Tool Number
2	Gearbox Bevel Gearshaft Assembly - Disassembly (continued)	
	Drift, gear roller bearing inner race	PWA 50469
	Drift, housing ball bearing outer race	PWA 50621
	Split Plate, gear ball bearing inner race - - - - -	PWA 50624

## ILLUSTRATED SUPPORT EQUIPMENT



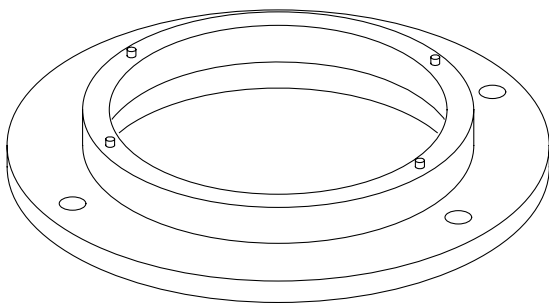
PWA 7368 -C

Figure T1. PWA 7368 Base



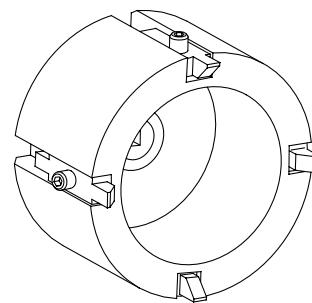
PWA 21500 -C

Figure T2. PWA 21500 Holding Adapter



PWA 50454 -C

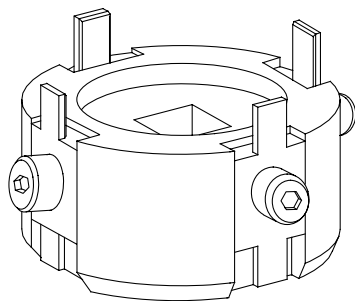
Figure T3. PWA 50454 Holder



PWA 50455 -C

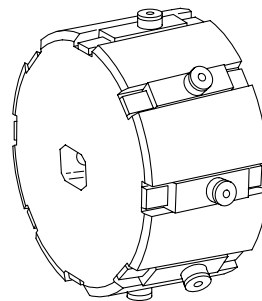
Figure T4. PWA 50455 Wrench

ILLUSTRATED SUPPORT EQUIPMENT



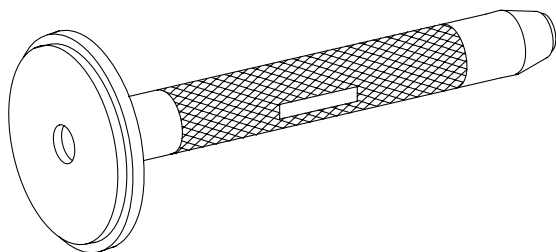
PWA 50459 -C

**Figure T5. PWA 50459 Wrench**



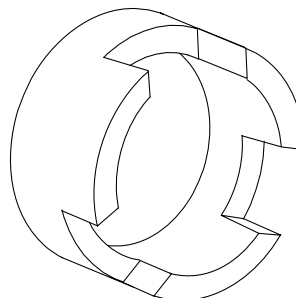
PWA 50460 -C

**Figure T6. PWA 50460 Wrench**



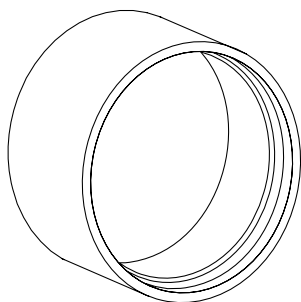
PWA 50461 -C

**Figure T7. PWA 50461 Drift**



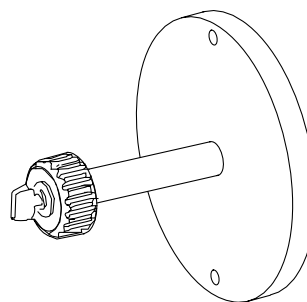
PWA 50462 -C

**Figure T8. PWA 50462 Base**



PWA 50463 -C

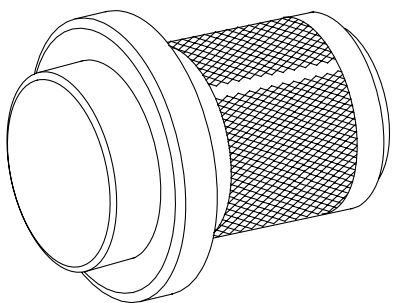
**Figure T9. PWA 50463 Base**



PWA 50465 -C

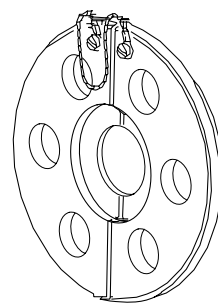
**Figure T10. PWA 50465 Holder**

ILLUSTRATED SUPPORT EQUIPMENT



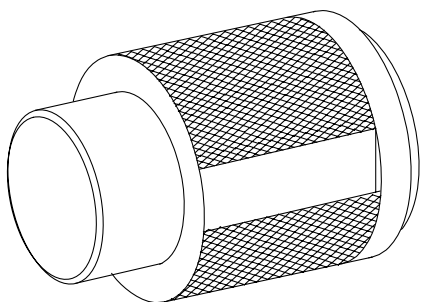
PWA 50467 -C

Figure T11. PWA 50467 Drift



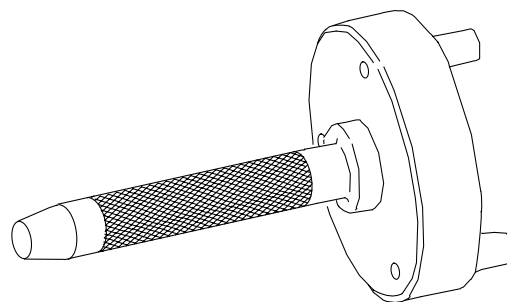
PWA 50468 -C

Figure T12. PWA 50468 Split Plate



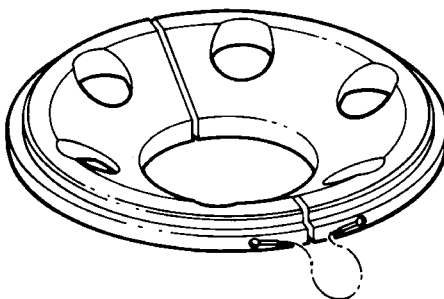
PWA 50469 -C

Figure T13. PWA 50469 Drift



PWA 50621 -C

Figure T14. PWA 50621 Drift



PWA 50624 -C

Figure T15. PWA 50624 Split Plate

**1. INTRODUCTION.**

- a. This work package contains instructions for disassembly of the gearbox bevel gearshaft.

(5) Using PWA 50460 wrench, and breaker bar, remove nut(1).

(6) Remove and discard key washer(2). Remove tools.

**2. GEARBOX BEVEL GEARSHAFT ASSEMBLY - DISASSEMBLY.**

(See Figure 1.)

- a. Separate sealing sleeve(3, figure 1) from gearbox cover(15) and discard packing(4).

- b. Remove bearing retaining nut(1) as follows:

- (1) Secure PWA 50465 holder to PWA 21500 adapter.

- (2) Remove cap screw detail and splined clamp detail from holder.

- (3) Install gearshaft(11) roller bearing end down, over rod detail.

- (4) Install splined clamp detail in gearshaft(11) so splines of detail mesh with gearshaft splines and secure with cap screw.

- c. Remove ball bearing inner races(5 and 10), ball bearing cage balls(6), and free sealing sleeve(3) from gearshaft(11) as follows:

- (1) Position gearbox bevel gearshaft assembly on work bench with bevel gear(11) facing upward.

- (2) Install PWA 50624 split plate under bevel gear(11), engaging inner race lower section(10).

- (3) Install assembly and PWA 50624 split plate into PWA 7368 base, bevel gear(11) facing down.

- (4) Use PWA 50467 drift and standard arbor press to press gearshaft(11) from inner races.

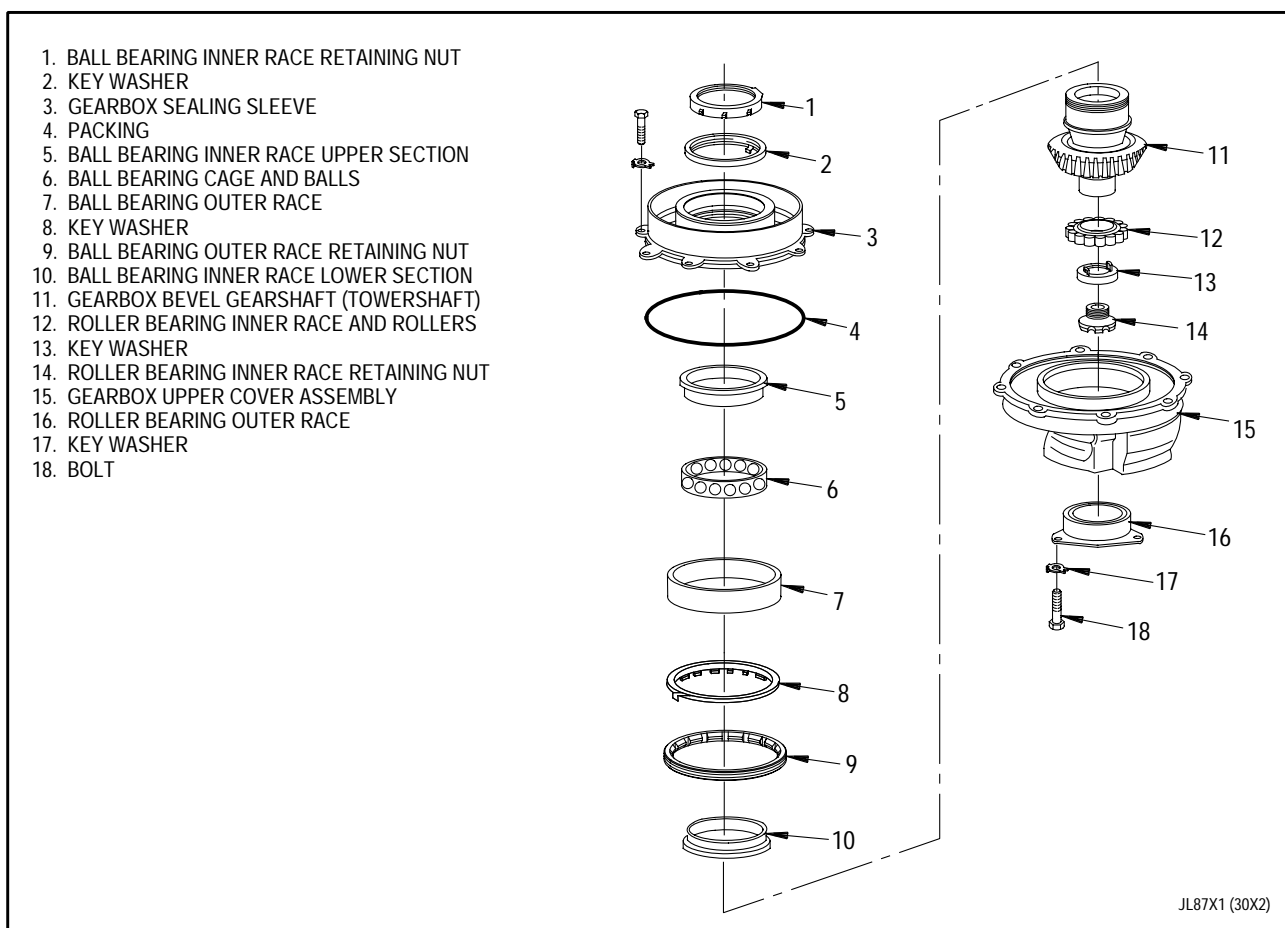


Figure 1. Gearbox Bevel Gearshaft Assembly - Disassembly

- (5) Preserve bearings or bearing details with engine oil and place in protective, labeled containers.
- (6) Store both inner races, cage and balls together in clean, labeled container.
- d. Remove ball bearing outer race retaining nut(9) as follows:
  - (1) Secure PWA 50454 holder to PWA 21500 adapter.
  - (2) Unbend tabs on keywasher(8) securing retaining nut(9).
  - (3) Install sealing sleeve(3), retaining nut(9) up, on holder so dowel pins of holder engage bolt holes in sleeve scallops.
  - (4) Using PWA 50455 wrench, and standard breaker bar, remove nut(9).
  - (5) Remove and discard key washer(8).
- e. Remove ball bearing outer race(7) from sealing sleeve(3) as follows:
  - (1) Place sealing sleeve(3) flange down, on PWA 50463 base.
  - (2) Position PWA 50621 drift so pins of drift pass through scallops in sleeve and rest on end face of bearing race(7) and using standard arbor press, press race from sleeve.



- (3) Preserve bearings or bearing details with engine oil and place in protective, labeled containers.
  - (4) Store outer race, cage and balls with both inner races, previously removed, in same container.
- f. Remove roller bearing inner race retaining nut(14) as follows:
- (1) Unbend key washer(13) securing retaining nut(14).
  - (2) Secure PWA 50465 holder to PWA 21500 adapter.
  - (3) Ensure splined clamp detail is secured tightly by thumbscrew detail.
  - (4) Place gear assembly, ball bearing end down, on holder so splined clamp detail meshes with shaft splines.
- (5) Using PWA 50459 wrench, and standard breaker bar, remove bearing retaining nut.
  - (6) Remove and discard key washer(13). Remove tools.
- g. Remove roller bearing inner race and rollers(12) as follows:
- (1) Position PWA 50468 split plate under inner race and rollers(12).
  - (2) Position plate and gear in PWA 7368 base.
  - (3) Using PWA 50469 drift and standard arbor press, press gear from inner race and rollers.
  - (4) Store inner race and rollers in clean, labeled container.

**T.O. 2J-F100-53-11**

**WP 027 00**

- h. Remove roller bearing outer race(16) as follows:
  - (1) Remove bolts(18) and key washers(17) Discard key washers.
  - (2) Place cover(15), bearing end down, on PWA 50462 base so three corners of bearing flange are aligned with slots in base.
  - (3) Using PWA 50461 drift and standard arbor press, press outer race(16) from cover.
  - (4) Preserve bearings or bearing details with engine oil and place them in protective, labeled containers.
  - (5) Store outer race(16) in same container as previously removed inner race and rollers(12).

**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**REDUCTION GEARBOX ASSEMBLY -**

**DISASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 12

<b>PAGE NO.</b>		<b>CHANGE NO.</b>	<b>PAGE NO.</b>		<b>CHANGE NO.</b>	<b>PAGE NO.</b>		<b>CHANGE NO.</b>
1 - 3	. . . . .	17	9	. . . . .	11	11	. . . . .	17
4 - 5	. . . . .	11	10	. . . . .	0	12	Blank . . . . .	0
6 - 8	. . . . .	0						

## REFERENCE MATERIAL REQUIRED

## Title

## Number

Standard Maintenance Procedures - - - - -

T.O. 2-1-111

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

## Nomenclature

## Specification/Vendor Part Number

GLOVES, NYLON LINT-FREE  
OIL, LUBRICATINGSTYLE NO. 4312  
MIL-L-7808

## EXPENDABLE ITEMS

None

## APPLICABLE SUPPORT EQUIPMENT

## Paragraph

## Function - Tool Nomenclature

## Tool Number

2

REDUCTION GEARBOX ASSEMBLY - DISASSEMBLY

FIXTURE, HOLDING, REDUCTION GEARBOX - - - - -

PWA 57072

ADAPTER, HOLDING, VARIOUS BASES - - - - -

PWA 21500

PULLER, CARBON SEAL RETAINER, REDUCTION GEARBOX - -

PWA 57061

WRENCH, REDUCTION GEARBOX BALL BEARING INNER RACE

NUT - - - - -

PWA 57057

PULLER, REDUCTION GEARBOX SEAL SEAT - - - - -

PWA 57060

WRENCH, REDUCTION GEARBOX BALL BEARING OUTER RACE

NUT - - - - -

PWA 57056

PULLER, REDUCTION GEARBOX GEAR - - - - -

PWA 57065

BASE, REDUCTION GEARBOX HOUSING - - - - -

PWA 57070

DRIFT, REDUCTION GEARBOX ROLLER BEARING OUTER RACE

PWA 57063

PULLER, ROLLER BEARING FUEL PUMP INTERNAL GEAR - -

PWA 57120

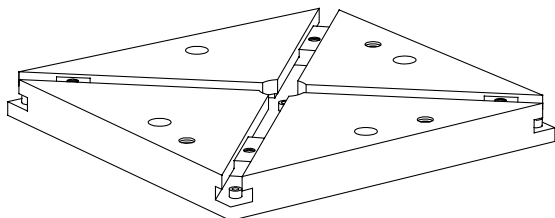
BASE, REMOVING, REDUCTION GEARBOX SEAL - - - - -

PWA 57059

GUIDE, REDUCTION GEARBOX CARBON SEAL - - - - -

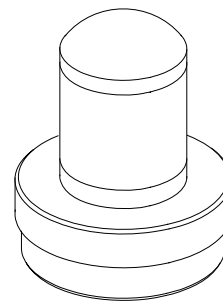
PWA 56699

# ILLUSTRATED SUPPORT EQUIPMENT



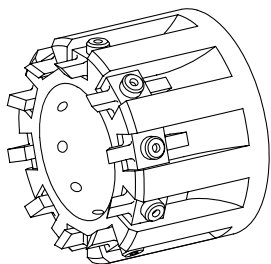
PWA 21500 -C

**Figure T1. PWA 21500 ADAPTER**



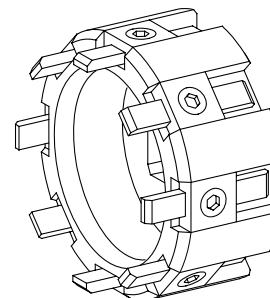
PWA 56699 -C

**Figure T2. PWA 56699 GUIDE**



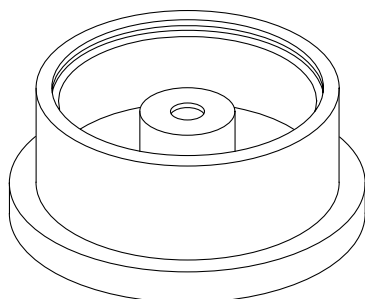
PWA 57056 -C

**Figure T3. PWA 57056 WRENCH**



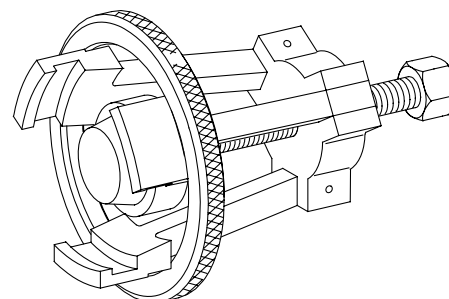
PWA 57057 -C

**Figure T4. PWA 57057 WRENCH**



PWA57059 -C

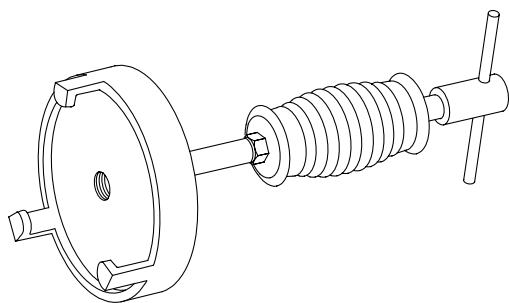
**Figure T5. PWA 57059 BASE**



PWA57060 -C

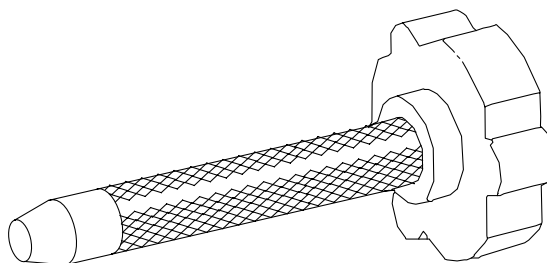
**Figure T6. PWA 57060 PULLER**

ILLUSTRATED SUPPORT EQUIPMENT (continued)



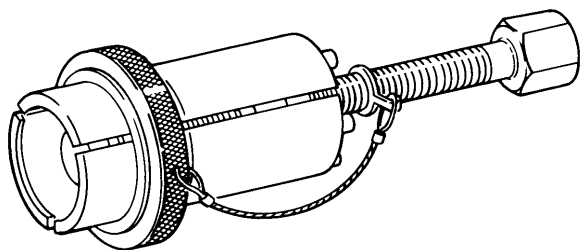
PWA 57061 -C

**Figure T7. PWA 57061 Puller**



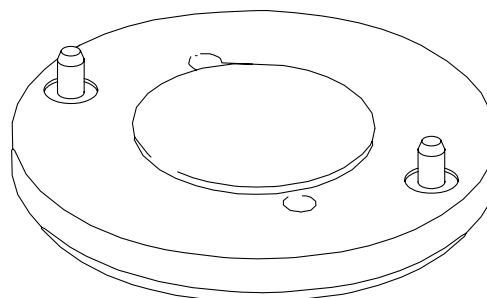
PWA 57063 -C

**Figure T8. PWA 57063 Drift**



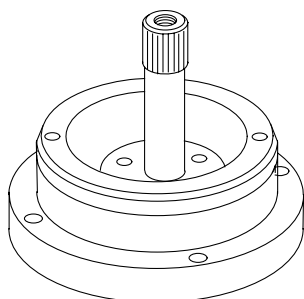
PWA 57065 -C

**Figure T9. PWA 57065 Puller**



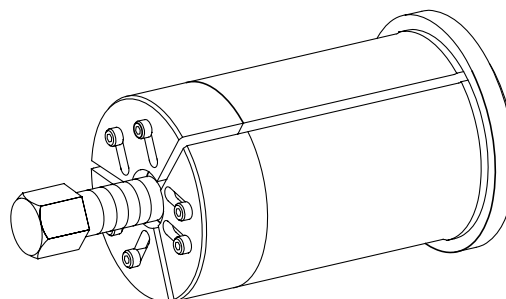
PWA 57070 -C

**Figure T10. PWA 57070 Base**



PWA 57072 -C

**Figure T11. PWA 57072 Fixture**



PWA 57120 -C

**Figure T12. PWA 57120 Puller**

## 1. INTRODUCTION.

- a. This work package contains instructions for disassembly of reduction gearbox assembly.

## 2. REDUCTION GEARBOX ASSEMBLY - DISASSEMBLY.

(See Figure 1.)

- a. Remove oil seal retainer assembly(6, figure 1) from reduction gearbox assembly(17) as follows:

- (1) Secure PWA 57072 holding fixture to PWA 21500 adapter.
- (2) Position reduction gearbox assembly(17), with finger details(18) of retaining plate facing down, in PWA 57072 holding fixture.
- (3) Remove bolts(4) and key washers(5) securing oil seal retainer assembly(6) to reduction gearbox assembly(17). Discard key washers(5).

- (4) Remove oil seal retainer assembly using PWA 57061 puller.

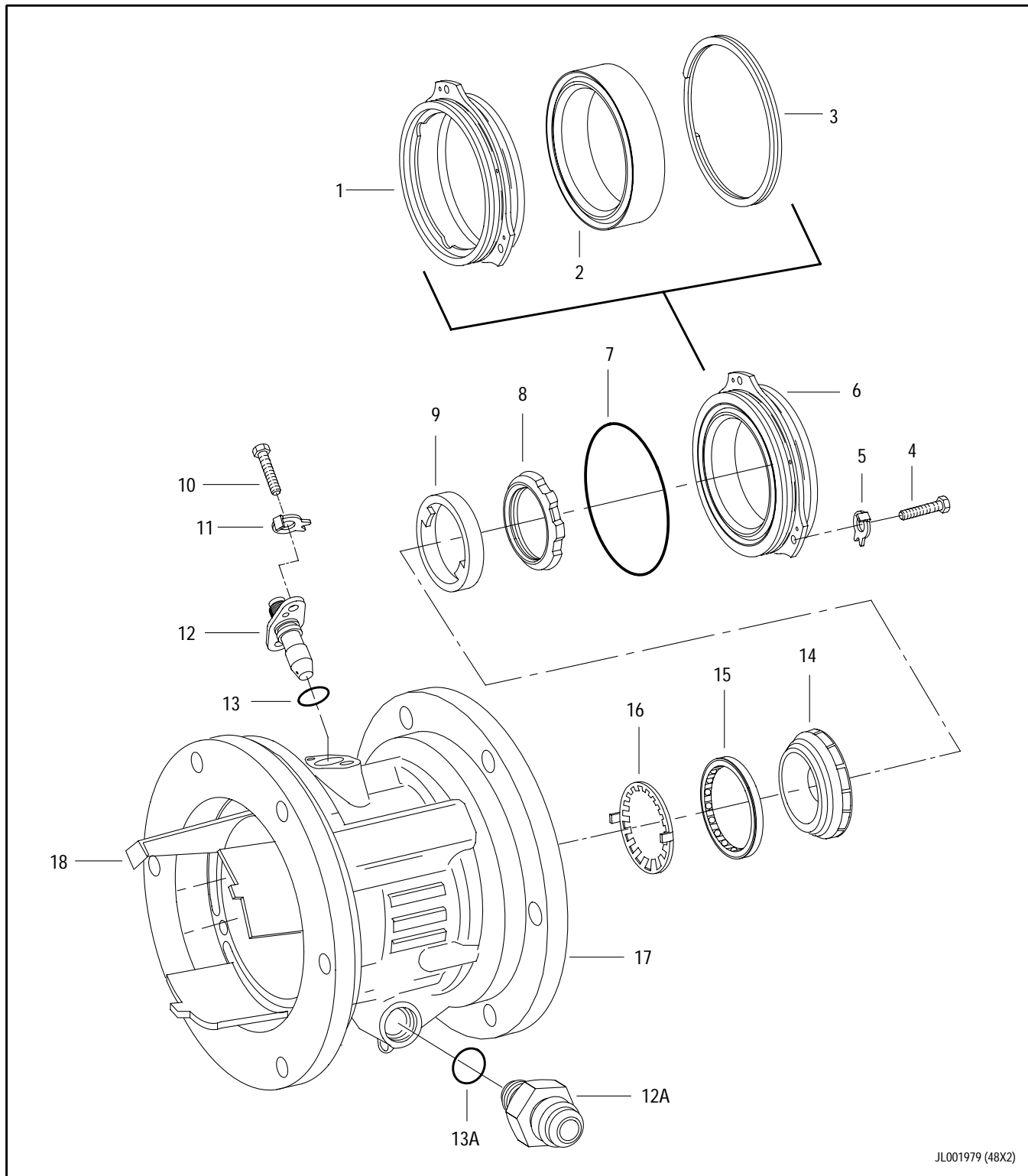
- (5) Remove and discard packing(7).

- b. Remove gearbox bearing nozzle(12) as follows:

- (1) Remove bolts(10) and key washers(11) securing nozzle(12).
- (2) Discard key washers(11).
- (3) Remove nozzle(12) and discard packing(13).
- (4) Remove adapter(12A) and discard packing(13A).

- c. Remove ball bearing inner race retaining nut(8) as follows:

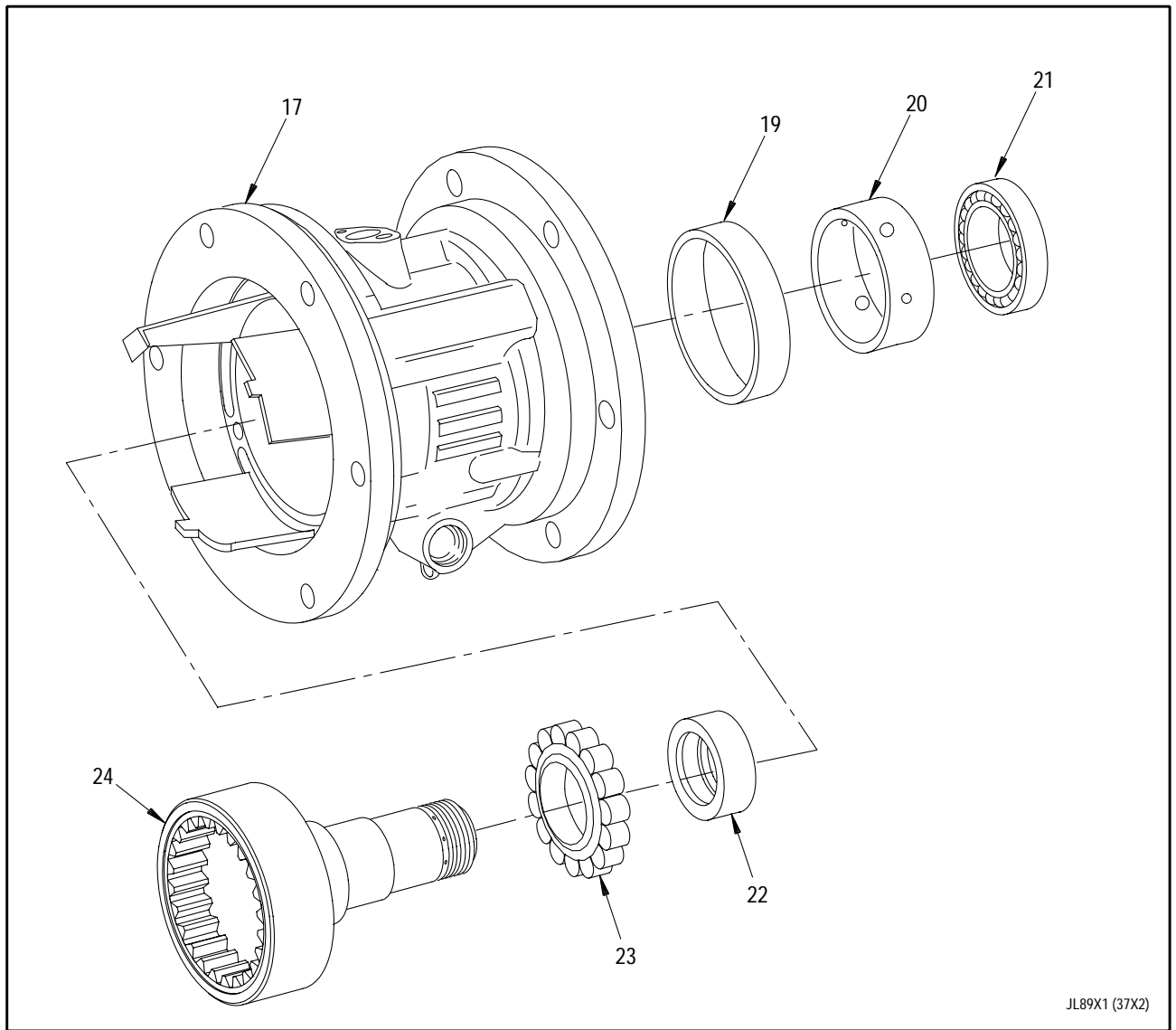
- (1) Unbend key washer(9) and remove nut(8) using PWA 57057 wrench and standard breaker bar.
- (2) Discard key washer(9).



JL001979 (48X2)

Figure 1. Reduction Gearbox Assembly - Disassembly (Sheet 1 of 2)





JL89X1 (37X2)

**Figure 1. Reduction Gearbox Assembly - Disassembly (Sheet 2 of 2)**

**Legend for figure 1**

1. Oil seal retainer
2. Face seal
3. Oil seal retaining ring
4. Bolt
5. Key washer
6. Oil seal retainer (assembled unit)
7. Packing
8. Ball bearing inner race retaining nut
9. Key washer
10. Bolt
11. Key washer
12. Reduction gearbox bearing nozzle
- 12A. Adapter
13. Packing
- 13A. Packing
14. Ball bearing seal seat
15. Ball bearing outer race retaining nut
16. Key washer
17. Reduction gearbox assembly
18. Finger details of retaining plate
19. Roller bearing outer race
20. Outer spacer
21. Ball bearing assembly
22. Inner spacer
23. Roller bearing inner race and rollers
24. Main fuel pump internal drive gear

- d. Remove ball bearing seal seat(14) as follows:
  - (1) Retract jackscrew detail of PWA 57060 puller.
  - (2) Position center plug detail of puller in bore of main fuel pump internal drive gear(24).
  - (3) Slip puller jaws under seal seat(14), and secure with ring detail.
  - (4) Using standard wrench, tighten jackscrew to remove seal seat(14).
- e. Remove ball bearing outer race retaining nut(15) as follows:
  - (1) Unbend key washer(16).
  - (2) Remove nut(15) using PWA 57056 wrench and standard breaker bar.
  - (3) Remove and discard key washer(16).
- f. Remove housing assembly(17) from main fuel pump internal drive gear(24) as follows:
  - (1) Position plug detail of PWA 57065 puller in bore of drive gear(24), and position puller jaw details in ball bearing assembly(21) puller groove.
  - (2) Secure jaws of puller with ring detail, and turn jackscrew detail using standard breaker bar to remove housing assembly(17) from drive gear assembly(24).
- g. Remove ball bearing assembly(21), outer spacer(20), and roller bearing outer race(19) from housing assembly(17) as follows:
  - (1) Install housing assembly(17) into PWA 57070 base with finger details(18) of retaining plate facing upward.
  - (2) Install PWA 57063 drift in housing assembly(17), through scallops in retaining plate.
  - (3) Press to remove roller bearing outer race(19), outer spacer(20), and ball bearing assembly(21) from housing assembly(17), using standard arbor press.
  - (4) Remove housing assembly(17) from PWA 57070 base.

- (5) Preserve bearings or bearing details with engine oil and place them in protective, labeled containers.
  - (6) Store ball bearing assembly(21) and roller bearing outer race(19) in clean labeled containers.
- h. Remove roller bearing inner race and rollers(23) and inner spacer(22) from main fuel pump internal drive gear(24) as follows:
- (1) Position PWA 57120 puller on drive gear(24), with plug detail centered in bore.
  - (2) Engage puller legs under roller bearing inner race and rollers(23), and secure with ring detail.
  - (3) Turn jackscrew with standard wrench to remove bearing inner race and rollers(23) and spacer(22).
  - (4) Preserve bearings or bearing details with engine oil. Store inner race and rollers(23) with previously removed roller bearing outer race(19). Wrap bearing details to prevent damage.

i. Disassemble oil seal retainer assembly(6) as follows:

- (1) Remove oil seal retaining ring(3).
- (2) Position seal assembly(2, figure 2) in PWA 57059 base, with carbon seal facing up.
- (3) Position pilot detail of PWA 56699 guide into pilot hole in base(3).
- (4) Press seal(2) from retainer, using 1/2 ton minimum capacity arbor press or equivalent.

(5) Prepare carbon seals for shipping and handling as follows:

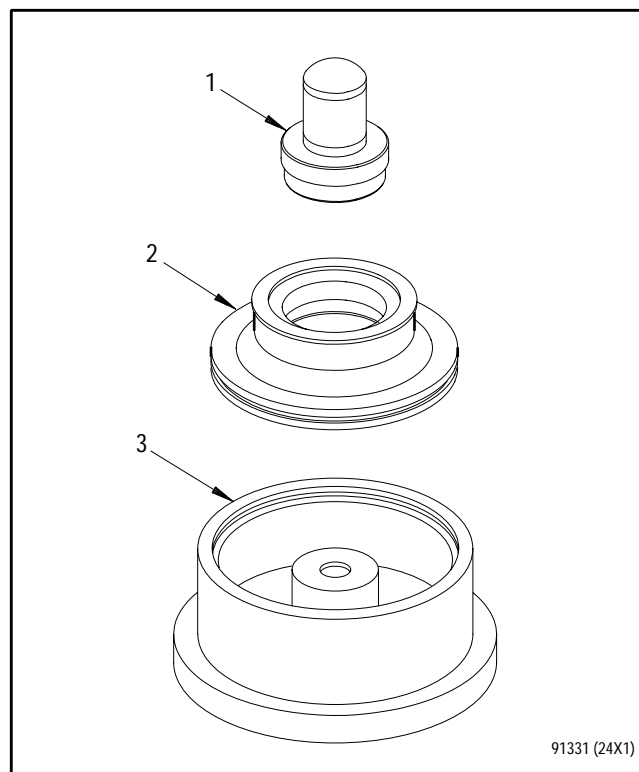
- (a) If carbon seals are being shipped outside depot

facility, box each carbon seal individually. Place a cardboard collar around carbon portion of seal.

- (b) If carbon seals are being locally (in-house) handled, place carbon seals between two pieces of styrofoam wrapped in plastic or equivalent, slightly larger than seal. Use tape to close open ends around seal and place in cardboard box.

(6) Store seal separately, it is easily damaged.

(7) Seal assembly(2) will be inspected as assembled unit. Further disassembly may be directed at that time.



1. Guide (PWA 56699)
2. Seal Assembly
3. Base (PWA 57059)

**Figure 2. Reduction Gearbox Face Seal Disassembly Tooling**



# WORK PACKAGE

## TECHNICAL PROCEDURES

SEAL ASSEMBLY, FACE (DEAERATOR IMPELLER SHAFT) -

## DISASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0	4	Blank	0	

T.O. 2J-F100-53-11  
WP 029 00

REFERENCE MATERIAL REQUIRED

Title	Number
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Carbon Face Type Oil Seals - Cleaning - - - - -	WP 201 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None



**1. INTRODUCTION.**

- a. This work package contains instructions for disassembly of face seal assembly.

**2. FACE SEAL ASSEMBLY (DEAERATOR IMPELLER SHAFT) - DISASSEMBLY.**

- a. Disassemble face seal assembly as follows:

- (1) Insert scribe into slots on seal case 180 degrees apart and separate retainer from seal case.

- (2) Remove carbon seal from seal case.
- (3) Remove preformed packing from seal case.
- (4) Remove flat washer from seal case.
- (5) Remove wave washer spring from seal case.
- (6) Clean seal assembly per WP 201 00, paragraph 6.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### SEAL ASSEMBLY, FACE (SPUR BEVEL GEARSHAFT) -

### DISASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0	4	Blank	0	

T.O. 2J-F100-53-11  
WP 030 00

REFERENCE MATERIAL REQUIRED

Title	Number
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Carbon Face Type Oil Seals - Cleaning - - - - -	WP 201 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

- a. This work package contains instructions for disassembly of face seal assembly.

**2. FACE SEAL ASSEMBLY (SPUR BEVEL GEARSHAFT) - DISASSEMBLY.**

- a. Disassemble face seal assembly as follows:

- (1) Insert scribe into slots on seal case 180 degrees apart and separate retainer from seal case.

- (2) Remove carbon seal from seal case.
- (3) Remove preformed packing from seal case.
- (4) Remove flat washer from seal case.
- (5) Remove wave washer spring from seal case.
- (6) Clean seal assembly per WP 201 00, paragraph 6.



# WORK PACKAGE

## INTRODUCTION

## GEARBOX MODULE PARTS -

## CLEANING

EFFECTIVITY: ENGINE MODEL F100-PW-229

### LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2					0

**1. INTRODUCTION.**

- a. This work package introduces the 200 00 through 299 00 series of work packages for the gearbox module parts - cleaning. The following work packages are included in this series.

<b>WP No.</b>	<b>Title</b>
201 00	Gearbox Module Parts - Cleaning
202 00 through 299 00	Open



**WORK PACKAGE****TECHNICAL PROCEDURES****GEARBOX MODULE PARTS -****CLEANING****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 24

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 . . . . .	23	8A Added . . . . .	23	10B Blank Added . . . . .	23
2 - 3 . . . . .	1	8B Blank Added . . . . .	23	11 - 13 . . . . .	1
4 - 6 . . . . .	23	9 - 10 . . . . .	23	14 . . . . .	23
7 . . . . .	1	10A Added . . . . .	23	15 - 19 . . . . .	1
8 . . . . .	23			20 Blank . . . . .	0

**REFERENCE MATERIAL REQUIRED**

<b>Title</b>	<b>Number</b>
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
General Cleaning Procedures - - - - -	WP 031 00
Cleaning, Vapor Degreaser (SPOP 3) - - - - -	SWP 031 01
Cleaning, Carbon Solvent and Paint Stripper, Two Step (SPOP 7) - - - - -	SWP 031 04
Cleaning, Alkaline Rust Remover, Quick Soak (SPOP 18) - -	SWP 031 08
Cleaning, Alkaline Rust Remover, Long Soak (SPOP 203) - -	SWP 031 09

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

<b>Nomenclature</b>	<b>Specification/Vendor Part Number</b>
Alkaline rust remover	MIL-C-14460
Solvent, petroleum	P-D-680, Type II
Oil, lubricating	MIL-L-7808
Trichloroethane	MIL-T-81533
Oil, corrosive preventive	MIL-C-8188

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

## 1. INTRODUCTION.

- a. This work package contains a table of all gearbox module parts requiring cleaning. The table lists the part by name and the part number, identifies the parent material, illustrates the part, and provides approved cleaning instructions.

## 2. CLEANING.

(See Table 1.)

- a. Recommended cleaning work package, subordinate work package, or SPOP options for each part are listed in order of increasing severity. The primary purpose of cleaning is to prepare part for inspection. Select the least severe process for this purpose, based on operator experience. Refer to a more severe process only if required for effective results.
- b. Refer to Table 1 for cleaning instructions of gearbox module parts.

Table 1. Gearbox Module Parts - Cleaning

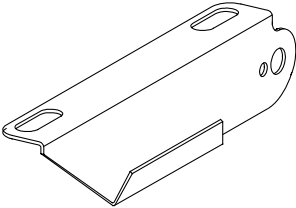
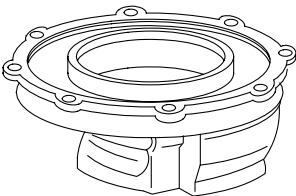

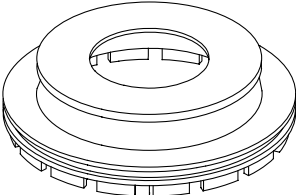
Part Name	Illustration Typical Part Number and Parent Material	Special Cleaning Instructions	Cleaning WP/SWP Reference (T.O. 2J-F100-53-1)
1. Baffle - gearbox housing	 <p>PN 4068423 -C <b>PN 4068423</b></p>	-	SWP 031 01, SWP 031 04
1A. Cover assembly - gearbox upper	 <p>PN 4047095 -C <b>PN 4047095</b> <b>AMS 4215</b> <b>Aluminum Alloy</b></p>	 <p>Do not clean housing in solutions composed of alkaline permanganate (SPOP 11, 13, 211, or 213). These solutions severely attack metal spray and flameplate coating.</p>	SWP 031 01, SWP 031 04
2. Cover - packing, gearbox	 <p>PN 4002737 -C <b>PN 4002737</b> <b>AMS 4120</b> <b>Aluminum Alloy</b></p>	-	SWP 031 01, SWP 031 04

Table 1. Gearbox Module Parts - Cleaning (continued)

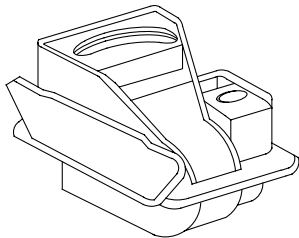
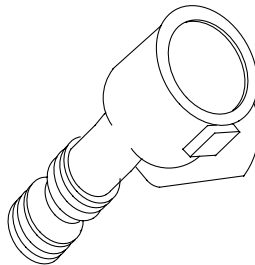
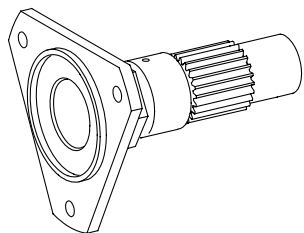
Part Nam	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
3. Cover - gearbox sump	 <p>8692</p> <p><b>PN 4023570</b> Or <b>PN 4068434</b> <b>AMS 4025</b></p>	-	SWP 031 01
4. Connector - tube, oil tank scavenge	 <p>PN 4044147 -C</p> <p><b>PN 4044147</b> <b>AMS 5646</b> <b>Stainless Steel</b></p>	See paragraph 8.	SWP 031 01, SWP 031 09
4A. Coupling assembly - remote gearbox driveshaft	 <p>PN 4067183 -C</p> <p><b>PN 4067183</b></p>	-	SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09

Table 1. Gearbox Module Parts - Cleaning (continued)

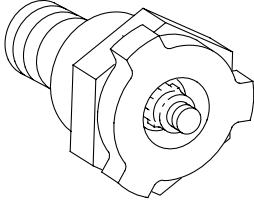
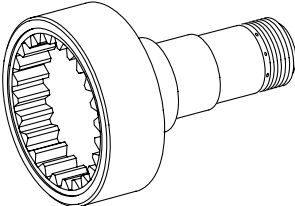
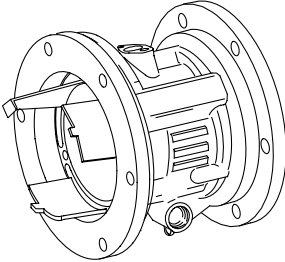

Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
5. Detector - metal chip, oil sump	 <p>PN 4061617 -C <b>PN 4061617</b></p>	See paragraph 4.	-
6. Gear - internal, main fuel pump drive	 <p>PN 4061076 -C <b>PN 4061076</b> <b>AMS 6265</b> <b>Wrought Low Alloy Steel</b></p>	-	SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09
7. Gearbox assembly, reduction	 <p>PN 4066398 -C <b>PN 4066398</b> <b>AMS 4215</b> <b>Aluminum Alloy</b></p>	 <p>Do not clean in solutions composed of alkaline permanganate (SPOP 11, 13, 211, or 213). These solutions severely attack metal spray and flameplate coatings.</p>	SWP 031 01, SWP 031 04

Table 1. Gearbox Module Parts - Cleaning (continued)

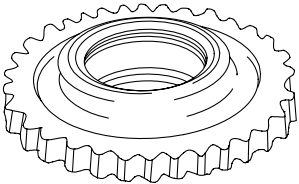
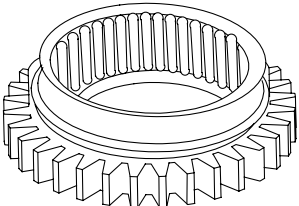
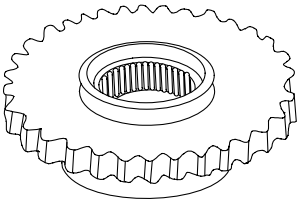
Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
8. Gear spur - gearbox	 <p>PN 4002724 -C</p> <p><b>PN 4002724</b> <b>AMS 6265</b> <b>Wrought Low Alloy Steel</b></p>  <p>PN 4002706 -C</p> <p><b>PN 4002706</b> <b>AMS 6265</b> <b>Wrought Low Alloy Steel</b></p>  <p>PN 4002718 -C</p> <p><b>PN 4002718</b> <b>AMS 6265</b> <b>Wrought Low Alloy Steel</b></p>	<p>-</p> <p>-</p> <p>-</p>	<p>SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09</p>

Table 1. Gearbox Module Parts - Cleaning (continued)

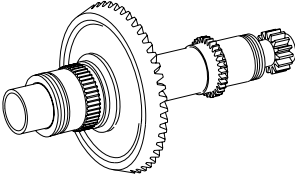
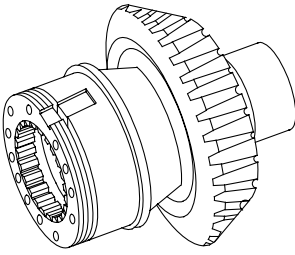
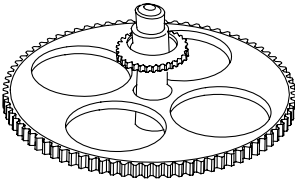
Part Nam	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
9. Gearshaft - assembly, bevel, spur, gearbox drive	 PN 4067176 -C <b>PN 4067176</b>	-	SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09
10. Gearshaft - bevel, gearbox	 PN 4025256 -C <b>PN 4025256</b> <b>AMS 6265</b> <b>Wrought Low Alloy Steel</b>	-	SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09
11. Gearshaft - spur, gearbox	 PN 4017949 -C <b>PN 4017949</b> <b>AMS 6265</b> <b>Wrought Low Alloy Steel</b>	-	SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09



Table 1. Gearbox Module Parts - Cleaning (continued)

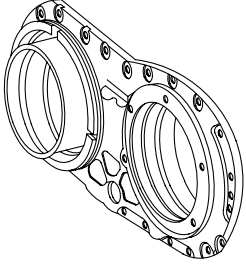
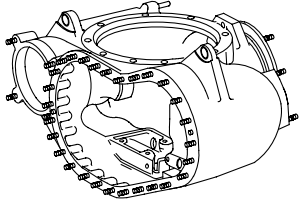
Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
12. Housing assembly - gearbox (front)	 <p>PN 4068639 -C</p> <p><b>PN 4068639</b> <b>AMS 4215</b> <b>Aluminum Alloy</b></p>	<p><b>CAUTION</b></p> <p>Do not clean housing in solutions composed of alkaline permanganate (SPOP 11, 13, 211, or 213). These solutions severely attack metal spray and flameplate coating.</p>	SWP 031 01, SWP 031 04
13. Housing assembly - gearbox (rear)	 <p>PN 4070990 -C</p> <p><b>PN 4070990</b> <b>AMS 4215</b> <b>Aluminum Alloy</b></p>	<p><b>CAUTION</b></p> <p>Do not clean housing in solutions composed of alkaline permanganate (SPOP 11, 13, 211, or 213). These solutions severely attack metal spray and flameplate coating.</p>	SWP 031 01, SWP 031 04



Table 1. Gearbox Module Parts - Cleaning (continued)

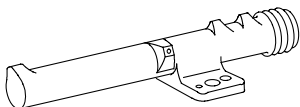
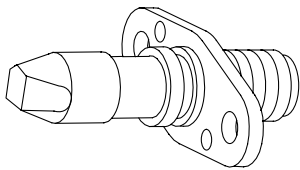
Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
13A. Nozzle - gearbox bearing	 <p>PN 4057397 -C <b>PN 4057397</b></p>	-	SWP 031 01, SWP 031 09
14. Nozzle - reduction gearbox bearing	 <p>PN 4061081 -C <b>PN 4061081</b> <b>AMS 5646</b> <b>Stainless Steel</b></p>	-	SWP 031 01, SWP 031 09

Table 1. Gearbox Module Parts - Cleaning (continued)

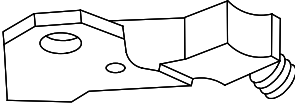
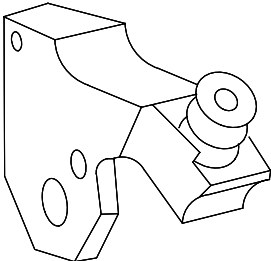
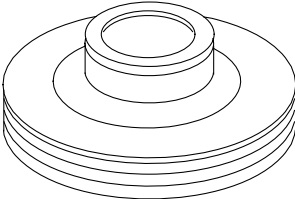
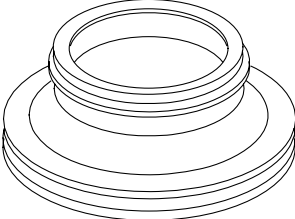
Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
14A. Nozzle - oil, gear pump	 <p>PN 4065137 -C</p> <p><b>PN 4065137</b></p>  <p>PN 4065139 -C</p> <p><b>PN 4065139</b></p>	-	SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09
15. Retainer - oil seal, gearbox	 <p>PN 4002716 -C</p> <p><b>PN 4002716</b> <b>AMS 4120</b> <b>Aluminum Alloy</b></p>  <p>PN 4002707 -C</p> <p><b>PN 4002707</b> <b>AMS 4120</b> <b>Aluminum Alloy</b></p>	-	SWP 031 01, SWP 031 04

Table 1. Gearbox Module Parts - Cleaning (continued)

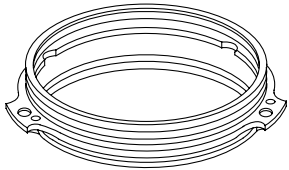
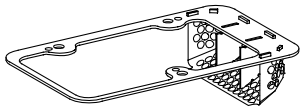
Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
16. Retainer - oil seal, reduction gearbox	 <p>PN 4061082 -C</p> <p><b>PN 4061082</b></p> <p><b>AMS 4117</b></p> <p><b>Aluminum Alloy</b></p>	-	SWP 031 01, SWP 031 04
16A. Screen - protective, gearbox sump cover, assembly	 <p>PN 4058696 -C</p> <p><b>PN 4058696</b></p>	-	SWP 031 01



Table 1. Gearbox Module Parts - Cleaning (continued)

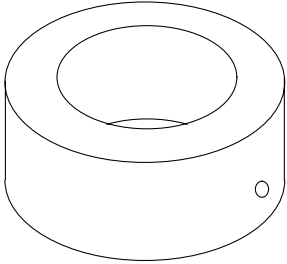
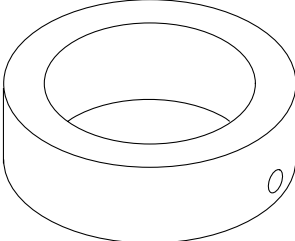
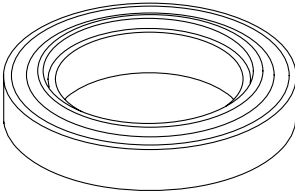
Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
17. Seal - face		See paragraph 6.	-
	<p>PN 4047344 -C</p> <p><b>PN 4047344</b> <b>Carbon</b></p> 		
	<p>PN 4047343 -C</p> <p>PN 4047343 Carbon</p>  <p>PN 4061088 -C</p> <p>PN 4061088</p> <p>And</p> <p>PN 4065385</p>		-

Table 1. Gearbox Module Parts - Cleaning (continued)

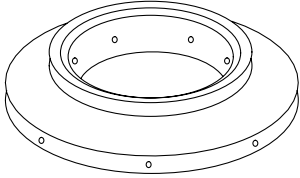
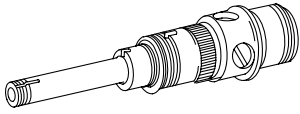
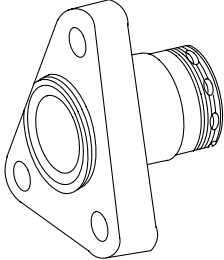
Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
18. Seat - bearing gearbox bearing seal	 <p>PN 4066397 -C <b>PN 4066397</b> <b>AMS 6265</b> <b>Wrought Low Alloy Steel</b></p>	-	SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09
19. Shaft - gearbox deaerator impeller	 <p>PN 4038802 -C <b>PN 4038802</b> <b>AMS 6265</b> <b>Wrought Low Alloy Steel</b></p>	-	SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09
20. Shaft - gearbox idler gear	 <p>PN 4053557 -C <b>PN 4053557</b> <b>AMS 6322</b> <b>Wrought Low Alloy Steel</b></p>	-	SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09



Table 1. Gearbox Module Parts - Cleaning (continued)

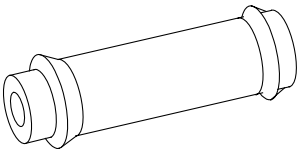
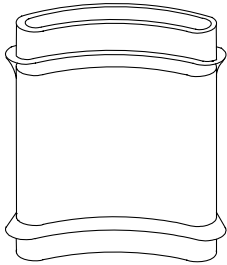
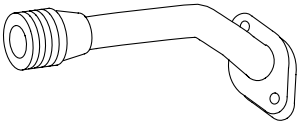
Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
21. Tube - scavenge, gearbox	 <p>PN 4023576 -C</p> <p><b>PN 4023576</b></p> <p><b>AMS 4025</b></p> <p><b>Or</b></p> <p><b>4080</b></p> <p><b>Aluminum Alloy</b></p>  <p>PN 4023577 -C</p> <p><b>PN 4023577</b></p> <p><b>AMS 4025</b></p> <p><b>Or</b></p> <p><b>4080</b></p> <p><b>Aluminum Alloy</b></p>	See paragraph 7.	-
22. Tube - scavenge, main oil pump	 <p>PN4045639 -C</p> <p><b>PN 4045639-01</b></p> <p><b>Titanium Alloy</b></p>	See paragraph 3.	SWP 031 08

Table 1. Gearbox Module Parts - Cleaning (continued)

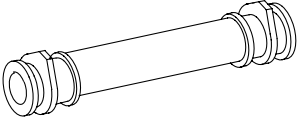
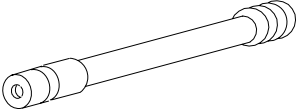
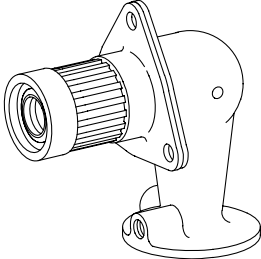
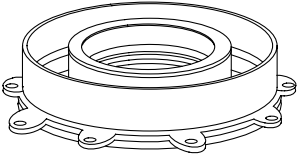
Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
23. Tube - transfer packing	 <p>PN 4017861 -C <b>PN 4017861</b> Titanium Alloy</p>	See paragraph 3.	SWP 031 08
23A. Tube - transfer, packing, gearbox bearing	 <p>PN 4057337 -C <b>PN 4057337</b></p>	-	SWP 031 01, SWP 031 09
24. Valve assembly - breather pressurizing	 <p>PN 4057681 -C <b>PN 4057681</b></p>	See paragraph 5.	-
25. Sleeve, sealing	 <p>8688 <b>PN 4070028</b> AMS 5344</p>	-	SWP 031 01, SWP 031 04

Table 1. Gearbox Module Parts - Cleaning (continued)

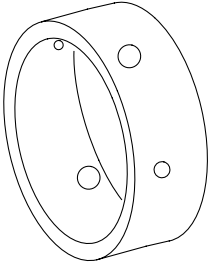
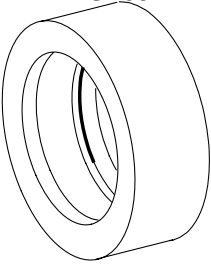
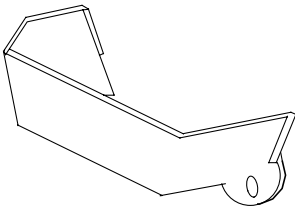
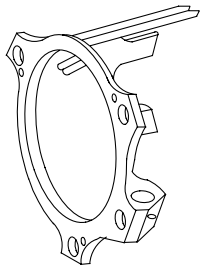
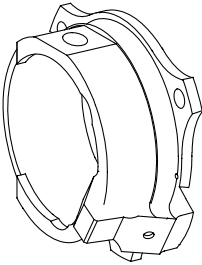
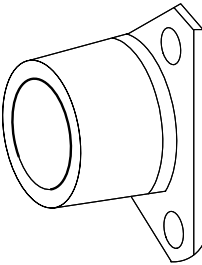
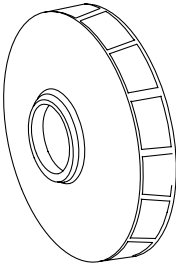
Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
26. Spacer - gearbox bearing	 <p>8689</p> <p><b>PN 4061079</b> <b>AMS 6322</b></p>  <p>8690</p> <p><b>PN 4061080</b> <b>AMS 6322</b></p>	-	SWP 031 01, SWP 031 04, SWP 031 08, SWP 031 09
27. Baffle, gearbox sump	 <p>G8691</p> <p><b>PN 4014781</b> <b>Or</b> <b>PN 4068474</b> <b>AMS 4025</b></p>	-	SWP 031 01

Table 1. Gearbox Module Parts - Cleaning (continued)

Part Name	Illustration Parent Material and Part Number	Special Cleaning Instructions	Cleaning WP/SWP (T.O. 2J-F100-53-1)
28. Plate, retaining	 <p>8694</p> <p><b>PN 4065138</b> <b>AMS 6322</b></p>  <p>8696</p> <p><b>PN 4064002</b> <b>AMS 6322</b></p>	-	SWP 031 01 SWP 031 04 SWP 031 08 SWP 031 09
29. Housing, gearbox bearing	 <p>8695</p> <p><b>PN 4057335</b> <b>AMS 5732</b></p>	-	WP 031 00 SWP 031 01
30. Impeller, deaerator	 <p>8698</p> <p><b>PN 4002719</b> <b>AMS 5350</b></p>	-	SWP 031 01 SWP 031 04

**3. TITANIUM TUBES (EXCEPT SHIELDED) - CLEANING.**

Trichloroethylene or perchloroethylene shall not be used as cleaning or flushing agents on titanium tubing. When flushing is necessary, use P-D-680, Type II petroleum solvent.

- a. Soak in SPS 240 alkaline rust remover (PMC 1269) for 2 minutes maximum. Refer to T.O. 2J-F100-53-1, SWP 031 08. Follow by immediate dip in cold water.
- b. Flush tube through with cold water.
- c. Air blast dry.

**4. METAL CHIP DETECTOR ASSEMBLY - CLEANING.**

- a. Wash chip detector with hydrocarbon solvent conforming to P-D-680, Type II petroleum solvent.
- b. Rinse in clear water.
- c. Dry chip detector with low pressure dry filtered air.
- d. Ensure that magnetic end of chip detector is free of metal flakes, chips, or ferric fuzz. Use small short bristled nylon brush or piece of masking tape to remove stubborn metal material. Repeat steps a., b., and c.

**5. BREATHER PRESSURIZING VALVE ASSEMBLY - CLEANING.**

- a. Moisten a clean cloth with P-D-680, Type II, petroleum solvent.
- b. Wipe exterior of breather pressurizing valve and valve housing with moistened cloth.
- c. Dry valve and valve housing with a clean, dry, lint-free cloth.

**6. CARBON FACE TYPE OIL SEALS -  
CLEANING.**



Never wipe seals with cloth.  
Do not wash seals with kerosene  
or any type carbon solvent.  
These materials can remove the  
carbon seal impregnant,  
resulting in increased surface  
porosity and higher wear rates.

- a. Clean seals only by soaking in  
clean, warm 120° to 140°F  
(49° to 60°C) MIL-L-7808  
lubricating oil for minimum of  
30 minutes. If necessary, coke  
deposits may then be removed  
with a dull-edged tool

**7. ALUMINUM TUBES - CLEANING.**

- a. Flush tube ID with  
trichloroethane or P-D-680, Type  
II petroleum solvent.
- b. If necessary, clean tube OD with  
P-D-680, Type II petroleum  
solvent and bristle brush.
- c. Drain tube thoroughly and remove  
excess fluid with air blast.  
Ensure no foreign material  
remains in tube.

**8. STAINLESS STEEL TUBES (EXCEPT  
SHIELDED) - CLEANING.**

- a. Flush ID with trichloroethane or  
P-D-680, Type II petroleum  
solvent.
- b. If necessary, clean OD of tube  
with P-D-680, Type II petroleum  
solvent and bristle brush.
- c. Drain tube thoroughly and remove  
excess fluid with air blast.  
Ensure no foreign material  
remains in tube.
- d. If harder to clean soils are  
encountered, clean as follows:
  - (1) Remove excess oil. Refer to  
T.O. 2J-F100-53-1,  
SWP 031 01.
  - (2) Clean per T.O. 2J-F100-53-1,  
SWP 031 09.
  - (3) Power flush tube with cold  
water after alkali dip.
  - (4) Air blast tubes until dry  
and cap tube ends.

## 9. ANTIFRICTION BEARINGS - CLEANING

- a. Clean bearings. Refer to T.O. 2-1-111, SPOP 14 and SPOP 214.
- b. Bearings shall be processed as follows:
  - (1) Mainshaft bearings shall remain assembled during cleaning.



Mechanical cleaning may damage bearings.

- (2) Mechanical cleaning, including tumbling, grinding, wire brushing, sanding, polishing, or any other process which will alter bearing surface, is not allowed.
    - (3) Dip mainshaft bearings in MIL-C-8188 corrosion preventive oil.





# WORK PACKAGE

## INTRODUCTION

## GEARBOX MODULE PARTS -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

### LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2 . . . . .	1	3 . . . . .	0	4 Blank . . . . .	0

**1. INTRODUCTION.**

- a. This work package introduces the 300 00 through 399 00 series of work packages for the gearbox module parts - inspection. The following work packages are included in this series:

<b>WP No.</b>	<b>Title</b>
301 00	Tubes, Gearbox External - Inspection
302 00	Detector, Metal Chip, Oil Sump - Inspection
303 00	Bearings, Gearbox and Reduction Gearbox - Inspection
304 00	Retainers, Oil Seal, Gearbox - Inspection
305 00	Cover, Packing, Gearbox - Inspection
306 00	Seal Assembly, Face - Inspection
307 00	Open
308 00	Open
309 00	Seal Seat, Reduction Gearbox Bearing - Inspection
310 00	Housing Assembly, Gearbox (Rear) - Inspection
311 00	Housing Assembly, Reduction Gearbox - Inspection
312 00	Housing Assembly, Gearbox (Front) - Inspection
313 00	Gearshaft, Spur, Gearbox (Oil Pump Drive Idler) - Inspection
314 00	Gearshaft, Bevel, Spur, Gearbox Drive - Inspection
315 00	Gear, Internal, Main Fuel Pump Drive - Inspection
316 00	Shaft, Gearbox Idler Gear - Inspection
317 00	Shaft, Gearbox Deaerator Impeller - Inspection
318 00	Gearshaft, Bevel, Gearbox - Inspection

WP No.	Title
319 00	Gear, Spur, Gearbox (Gearbox Drive Spur Bevel Gearshaft) - Inspection
320 00	Gear, Spur, Gearbox (Gearbox Idler Gearshaft) - Inspection
321 00	Spacer, (Reduction) Gearbox Bearing, Inner and Outer - Inspection
322 00	Gear, Spur, Gearbox (Deaerator Impeller Shaft) - Inspection
323 00	Impeller, Gearbox Deaerator - Inspection
324 00	Cover Assembly, Gearbox Upper - Inspection
325 00	Sleeve, Sealing Gearbox - Inspection
326 00	Cover Assembly, Gearbox Sump - Inspection
327 00	Plate Assembly, Retaining, Gearbox Bearing - Inspection
328 00	Plate, Retaining, Gearbox Bearing - Inspection
329 00	Tube, Transfer, Gearbox Bearing - Inspection
330 00	Baffle Assembly and Housing Baffle, Gearbox - Inspection
331 00	Valve Assembly, Breather Pressurizing - Inspection
332 00	Coupling, Remote Gearbox Driveshaft - Inspection
333 00	Nozzle, Gearbox Bearing (Reduction Gearbox) - Inspection
334 00	Fittings and Adapters, Gearbox - Inspection
335 00	Housing, Gearbox, Bearing - Inspection
336 00	Tube, Scavenge, Gearbox - Inspection
337 00	Nozzle, Gearbox, Bearing - Inspection
338 00	Oil Nozzles and Transfer Tube, Gearbox - Inspection
339 00	Retainer, (Reduction) Gearbox, Oil Seal - Inspection
340 00	Open
through	
341 00	
342 00	Screen, Protective, Gearbox Sump Cover - Inspection
343 through	Open
399 00	



# WORK PACKAGE

## TECHNICAL PROCEDURES

### TUBES, GEARBOX EXTERNAL -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 . . . . .	9	5 . . . . .	1	7 . . . . .	9
2 - 4 . . . . .	0	6 . . . . .	3	8 . . . . .	0

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Blue carbon paper	-
Solvent, petroleum	P-D-680, Type II

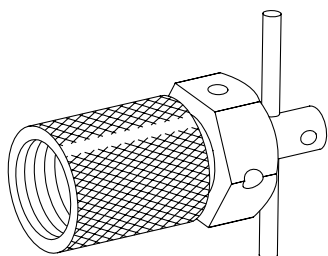
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

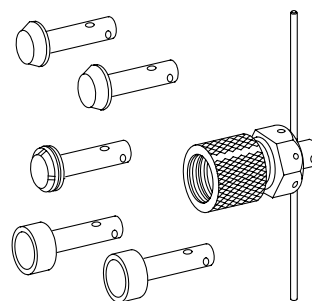
Paragraph	Function - Tool Nomenclature	Tool Number
3	Tubing - Pressure check	
	Fixture - Tube pressure test - - - - -	PWA 52930
	Plug - Tube pressure test - - - - -	PWA 53410
	Adapter - Tube pressure test - - - - -	PWA 53713
4	Tube - Conical seat inspection	
	Lap - Conical fitting - - - - -	PWA 51429
	Lap - Conical fitting - - - - -	PWA 52336

ILLUSTRATED SUPPORT EQUIPMENT



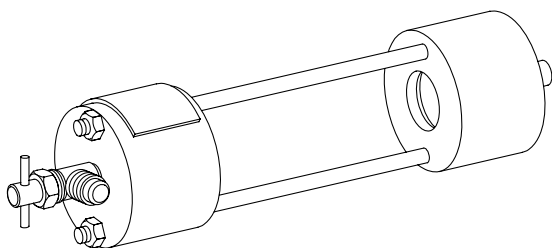
PWA 51429 -C

**Figure T1. PWA 51429 Lap**



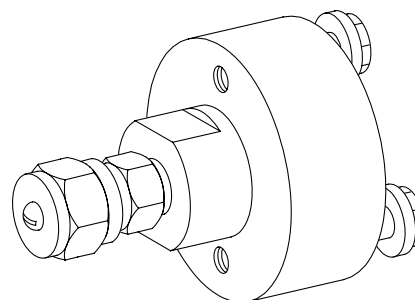
PWA 52336 -C

**Figure T2. PWA 52336 Lap**



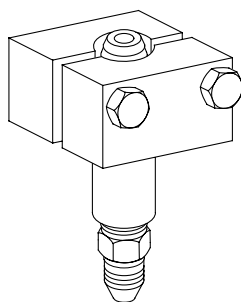
PWA52930 -C

**Figure T3. PWA 52930 Fixture**



PWA53410 -C

**Figure T4. PWA 53410 Plug**



PWA53713 -C

**Figure T5. PWA 53713 Adapter**

## 1. INTRODUCTION.

- a. This work package contains instructions for inspection of the packing transfer tube, the main oil pump scavenge tube assembly, and the oil tank scavenge tube connector.

## 2. GENERAL PHYSICAL INSPECTION.

(See Figure 1 and Tables 1 and 2.)

- a. Visually inspect for damage.
- b. Inspect per table 1, referring to table 2 to determine tubing material and dimensions.

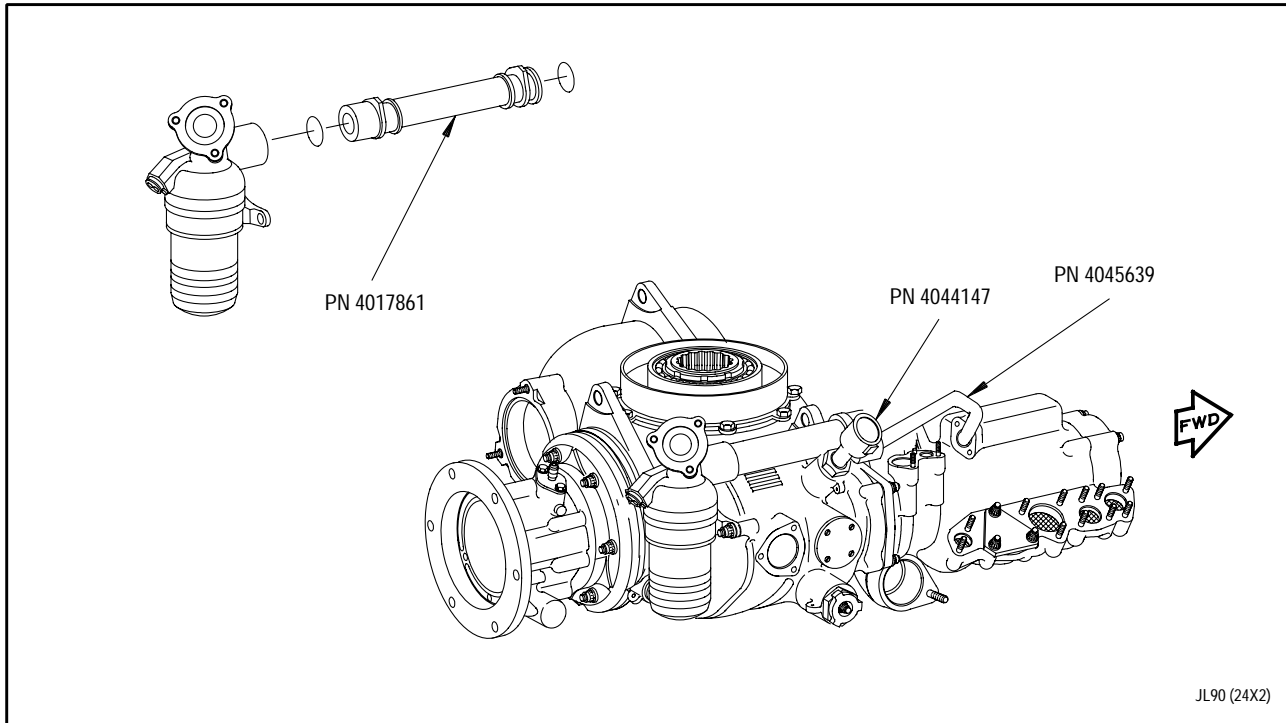


Figure 1. Gearbox Module External Tubing - Locator



Table 1. External Tubing - Inspection

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
Tubing -			
Dents	a. Depth to 5% of nominal tube OD.	a. Titanium 0.006 inch blend depth.	Blend per WP 401 00.
	b. No portion with sharp edges or corners of less than 0.060 inch.	b. Steel - 0.008 inch blend depth.	
Flattening (due to bending or twisting)	a. Maximum 5% of nominal tube OD for titanium oil lines.	Not reparable	Replace tube.
	b. Maximum 10% or nominal tube OD for all other lines.	Not reparable	Replace tube.
Nicks and gouges	0.004 inch depth	a. Titanium - 0.006 inch blend depth.	Blend per WP 401 00.
		b. Steel - 0.008 inch blend depth.	
Chafing	a. 0.004 inch depth.	Not reparable	Replace tube.
	b. 180 degrees of tube circumference.		
Scratches	a. 0.002 inch depth.	Not reparable	Replace tube.
	b. 180 degrees of tube circumference.	Not reparable	Replace tube.
Pitting	0.002 inch depth	Not reparable	Replace tube.

Table 1. External Tubing - Inspection (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
Tubing - (continued)			
Cracks	Not serviceable	Not repairable	Replace tube.
Tubing Details -			
Break in contact of seating surface	See paragraph 4.	See corrective action.	Lap repair per WP 401 00.
Conical seats -			
Scratches	0.001 inch depth	See corrective action.	Lap repair per WP 401 00.
Coupling nut -			
Damaged lockwire hole	Not serviceable	See corrective action.	Repair per WP 401 00.
Threads	Not serviceable	Remove all thread pickup and high metal.	Hand blend with fine abrasive stone to remove thread pickup and raised metal.
Ring groove	Not serviceable	Reparable	Hand blend with fine abrasive stone to remove groove pickup and raised metal.
Sealing surface	Not serviceable	Reparable	Hand blend with fine abrasive stone to remove surface pickup and raised metal.
Scavenge tube elbow-			
Raised metal	Not serviceable	See corrective action.	Deburr per WP 401 00.

**Table 2. Gearbox Module External Tubing - Material and Diameter**

<b>Part Number</b>	<b>Nomenclature</b>	<b>Material</b>	<b>OD (Inch)</b>	<b>Wall Thickness (Inch)</b>
4017861	Packing transfer tube (oil filter to main oil pump)	Titanium alloy	1.000	0.028
4045639-01	Main oil pump scavenge tube assembly - tube	Titanium alloy	0.7525	0.028
4044147	Oil tank scavenge tube connector - tube	AMS 5646 stainless steel	0.775	0.038

**3. TUBING - PRESSURE CHECK.**

(See Table 3.)

- a. Using appropriate plugs and adapters, cap tubes. (See table 3.) Install tubes in water-type test bench.
- b. Pressure check using standard procedures and test pressure of 500 psig for minimum of 1 minute.
- c. No leakage or deformation is acceptable.

**Table 3. Tubing Pressure Checking Tools**

<b>Tube Part Name</b>	<b>Tube Part Number</b>	<b>Adapter</b>	<b>Plug</b>	<b>Fixture</b>
Packing transfer tube	4017861	-	-	PWA 52930
Main oil pump scavenge tube	4045639-01	PWA 53713	PWA 53410	-

**4. TUBE CONICAL SEAT INSPECTION.**

(See table 2 and Table 4.)

- a. Select tool set from table 4 with appropriate tube OD. (See table 2.) Equivalent tooling may be used provided dimensional requirements are met.
- b. Check seat with bluing gage as follows:
  - (1) Moisten blue carbon paper with P-D-680, Type II petroleum solvent by laying paper on a clean, felt stamp pad which has been treated with solvent.
  - (2) Rub carbon paper on conical surface of bluing gage until surface is light, uniform blue.
  - (3) Place gage on part with blue coated surface contacting seating surface. To ensure full contact, gage may be rotated 1/8 turn maximum, then returned to starting position.
  - (4) To define pattern of surface contact, rotate gage 1/2 turn and return to starting position.
- c. Seats are acceptable without lapping provided.
  - (1) Continuous, circumferential sealing pattern.
  - (2) Surface scratches are less than 0.001 inch deep.
- d. Repair unacceptable conical seats by lapping per WP 401 00. (See table 4.)

**Table 4. Lap Tool - Dimensional Ranges**

<b>Lap Tool No.</b>	<b>Nominal Tube OD (Inch)</b>	<b>Thread Size</b>
PWA 52336	0.759	1.0625 - 12
PWA 51429	0.875	1.1875 - 12

# WORK PACKAGE

## TECHNICAL PROCEDURES

### DETECTOR, METAL CHIP, OIL SUMP -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

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2 . . . . .	0				

**T.O. 2J-F100-53-11**

**WP 302 00**

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of the metal chip detector assembly.

**2. METAL CHIP DETECTOR ASSEMBLY - INSPECTION.**

(See Table 1.)

- a. Visually inspect chip detector for damage.

**Table 1. Chip Detector - Inspection**

<b>Inspection Area - Condition</b>	<b>Maximum Serviceable Limits</b>	<b>Maximum Repairable Limits</b>	<b>Corrective Action</b>
Boss threads	Not serviceable	Minor damage reparable	Hand blend with fine abrasive stone to remove thread pickup and raised metal.
Pins - bent, loose, missing	Not serviceable	Not reparable	Replace chip detector.
Magnet - damaged, loose	Not serviceable	Not reparable	Replace chip detector.
Magnet - functional check	Must pick up two 5/16 inch diameter AISI 52100 or equivalent steel balls.	Not reparable	Replace chip detector.





# WORK PACKAGE

## TECHNICAL PROCEDURES

### BEARINGS, GEARBOX AND REDUCTION GEARBOX -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

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1 . . . . .	14	4 - 5 . . . . .	14	7 . . . . .	7
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**REFERENCE MATERIAL REQUIRED**

<b>Title</b>	<b>Number</b>
Standard Maintenance Procedures - - - - -	T.O. 1-1-111
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Antifriction Bearings, General Handling, Removal and Installation - - - - -	WP 022 00

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

<b>Nomenclature</b>	<b>Specification/Vendor Part Number</b>
Gloves, Nylon lint-free	Style No. 4312
Oil, lubricating	MIL-L-7808

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

## 1. INTRODUCTION.

- a. This work package contains instructions for inspection of gearbox and reduction gearbox, roller and ball bearings.

## 2. GEARBOX AND REDUCTION GEARBOX, ROLLER BEARINGS - INSPECTION.

(See Figure 1 and Table 1.)

- a. Inspect bearings. Refer to T.O. 2-1-111.
- b. Inspect dimensions. (See table 1.)
- c. Using scriber tracer, inspect roller bearing (PN 4061214) outer race for wear, eight places. (See figure 1.) If roller bearing PN 4061214 is rejected, replace oil pump idler shaft ball bearing (PN 4032007). Refer to paragraph 3.
  - (1) Vertical sensitivity shall be 0.000050 inch per division.
  - (2) Horizontal sensitivity must not be less than 0.005 inch per division.
  - (3) Reject any bearing that exhibits wear of 0.000025 inch or greater.
- d. Preserve bearings or bearing details with engine oil. Store bearings in clean, labeled containers with engine oil preservative. Refer to T.O. 2J-F100-53-1, WP 022 00.

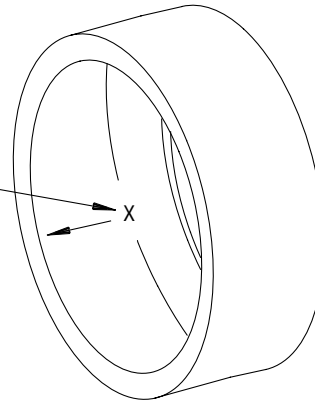
**Table 1. Gearbox and Reduction Gearbox, Roller Bearings - Limits**

Typical PN	Identification (Location in Main Gearbox)	Bore	Internal Radial Clearance
4001273	Idler gearshaft	0.9844 0.9841	0.0019 0.0013 (11 pounds)
4001274	Idler gearshaft	0.9844 0.9841	0.0019 0.0013 (11 pounds)
4001275	Idler gearshaft	0.9844 0.9841	0.0019 0.0013 (11 pounds)
4001276	Deaerator impeller shaft	1.3781 1.3778	0.0027 0.0021 (11 pounds)
4001277	Deaerator impeller shaft	1.3781 1.3778	0.0027 0.0021 (11 pounds)
4001278	Deaerator impeller shaft	1.3781 1.3778	0.0027 0.0021 (11 pounds)
4001282	Spur bevel gearshaft	2.1655 2.1651	0.0036 0.0030 (11 pounds)
4001285	Bevel gearshaft	1.3780 1.3778	0.0010 0.0004 (11 pounds)
4001286	Bevel gearshaft	1.3780 1.3778	0.0010 0.0004 (11 pounds)
4044745	Spur bevel gearshaft	1.3781 1.3778	0.0027 0.0021 (11 pounds)
4045089	Spur bevel gearshaft	2.1655 2.1651	0.0036 0.0030 (11 pounds)

**Table 1. Gearbox and Reduction Gearbox, Roller Bearings - Limits (continued)**

Typical PN	Identification (Location in Main Gearbox)	Bore	Internal Radial Clearance
4056259	Spur bevel gearshaft	2.1655 2.1651	0.0036 0.0030 (11 pounds)
4056321	Idler gearshaft	0.9844 0.9841	0.0019 0.0013 (11 pounds)
4056934	Bevel gearshaft	1.3780 1.3788	0.0010 0.0004 (11 pounds)
4061140	Reduction gearbox	1.7718 1.7715	0.0025 0.0018 (11 pounds)
4061142	Reduction gearbox	1.7718 1.7715	0.0025 0.0018 (11 pounds)
4061160	Reduction gearbox	1.7718 1.7715	0.0025 0.0018 (11 pounds)

AXIAL TRACE TO BEGIN AT "X" MARK (AS CLOSE TO  
OUTER RACE STEP AS POSSIBLE) AND TRACE ONWARD  
IN THE AXIAL DIRECTION AS INDICATED ON THE  
ARROW UNTIL THE INDICATOR TIP RUNS OFF THE RACE



JL91 (18X2)

**Figure 1. Outer Race Axial Trace**

### 3. GEARBOX AND REDUCTION GEARBOX, BALL BEARINGS - INSPECTION.

(See Figure 2. and Table 2.)

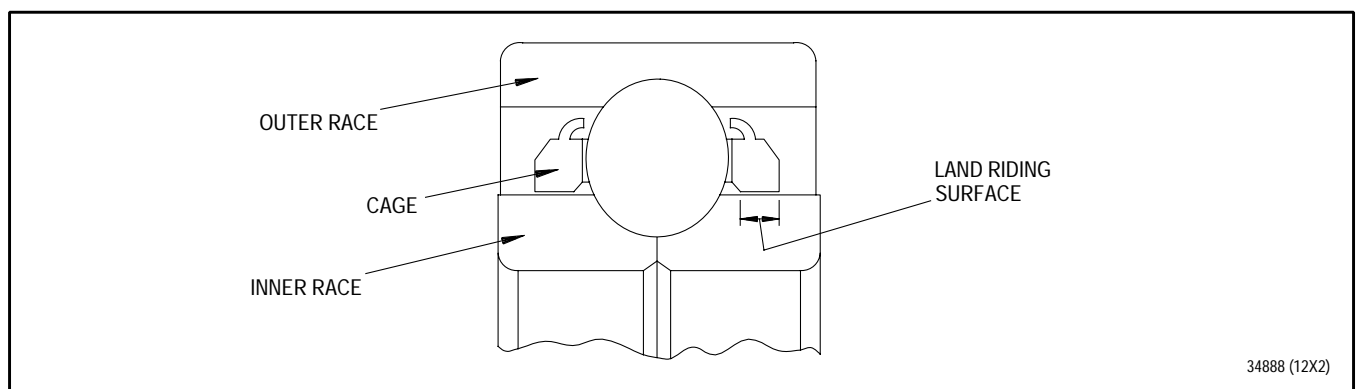
#### NOTE

- If main oil pump idler gearshaft ball bearing (PN 4032007) is rejected, replace oil pump idler gearshaft roller bearing (PN 4061214). Refer to table 1.
- Lower towershaft ball bearing PN 4061871 shall be replaced at On Condition Maintenance or at Depot Maintenance. If lower towershaft ball bearing (Typical PN 4081473) exhibits cage polishing across entire width of land riding surface in one of more circumferential locations, reject bearing. (This note takes precedence over table 7-1 of T.O. 2-1-111.) See figure 2.
- PTO gearshaft duplex bearings, PN 4040649, 4046808, 4056098, and 4062009 shall be discarded and replaced with a new bearing.

- Inspect bearing. Refer to T.O. 2-1-111.

- Inspect dimensions. (See table 2.)

- Following inspection, store bearings in clean, labeled containers with engine oil preservative. Refer to T.O. 2J-F100-53-1, WP 022 00.



**Figure 2. Lower Towershaft Ball Bearing - Inspection**

**Table 2. Gearbox and Reduction Gearbox, Ball Bearings - Limits**

Typical PN	Identification (Location in Main Gearbox)	Bore	Internal Radial Clearance
4001290	Bevel gearshaft	2.5592 2.5589	0.00410.0035 (33 pounds)
4001294	Deaerator impeller shaft	1.37811.3778	0.00200.0014(11 pounds)
4001296	Deaerator impeller shaft	1.37811.3778	0.00200.0014(11 pounds)
4004200	Bevel gearshaft	2.5592 2.5589	0.0041 0.0035 (33 pounds)
4045021	Bevel gearshaft	2.5592 2.5589	0.0041 0.0035 (33 pounds)
4058670	Deaerator impeller shaft	1.3781 1.3778	0.0020 0.0014 (11 pounds)
4061112	Reduction gearbox	1.7324 1.7321	0.0022 0.0015 (11 pounds)
4061139	Reduction gearbox	1.7324 1.7321	0.0022 0.0015 (11 pounds)
4061157	Reduction gearbox	1.7324 1.7321	0.0022 0.0015 (11 pounds)
4061159	Reduction gearbox	1.7324 1.7321	0.0022 0.0015 (11 pounds)
4066036	Deaerator impeller shaft	1.3781 1.3778	0.0020 0.0014 (11 pounds)



# WORK PACKAGE

## TECHNICAL PROCEDURES

### RETAINER, OIL SEAL, GEARBOX -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

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**T.O. 2J-F100-53-11**

**WP 304 00**

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of the gearbox oil seal retainers.

**2. GEARBOX OIL SEAL RETAINERS - INSPECTION.**

(See Table 1.)

- a. Visually inspect for damage.
- b. Inspect retainers. (See table 1.)

**Table 1. Gearbox Oil Seal Retainers - Inspection**

<b>Inspection Area - Condition</b>	<b>Maximum Serviceable Limits</b>	<b>Maximum Repairable Limits</b>	<b>Corrective Action</b>
External surface - Scratches	Not serviceable	See corrective action.	Replace retainer.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### COVER, PACKING, GEARBOX -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3 . . . . .	0	4 Blank . . . . .	0		

**T.O. 2J-F100-53-11**

**WP 305 00**

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of the gearbox packing cover.

**2. GEARBOX PACKING COVER - INSPECTION.**

(See Table 1.)

- a. Inspect cover. (See table 1.)

**Table 1. Gearbox Packing Cover - Inspection**

<b>Inspection Area - Condition</b>	<b>Maximum Serviceable Limits</b>	<b>Maximum Repairable Limits</b>	<b>Corrective Action</b>
External surface - Scratches	Not serviceable	See corrective action.	Replace cover.
Nicks	0.015 inch depth	See corrective action.	Replace cover.
Dents	0.050 inch depth	See corrective action.	Replace cover.
Galling	Not serviceable	See corrective action.	Replace cover.





# WORK PACKAGE

## TECHNICAL PROCEDURES

### SEAL ASSEMBLY, FACE -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 16

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 . . . . .	22	2 - 14 . . . . .	1	15 - 16 . . . . .	22

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Optical Flatness Check of Main Bearing Carbon Seals, Seal Plates, and Spacers - - - - -	SWP 091 06

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

## 1. INTRODUCTION.

- a. This work package contains instructions for inspection of face seal assembly.

## 2. GEARBOX SEAL ASEMBLIES - INSPECTION.

(See Figures 1 through 4.)

### NOTE

Inspect carbon seals in their respective steel housings. Do not remove carbon seals from housings.

- a. Inspect seals. (See figures 1 through 4.) Check manually for freedom of movement.

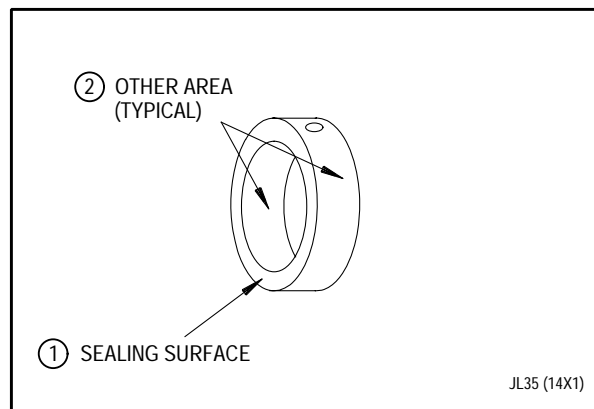


Figure 1. Gearbox Module Seal Assemblies - Inspection

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Sealing surface -			
Chips, nicks, scratches	Serviceable under the following conditions: <ul style="list-style-type: none"> <li>• A concentric circular area of not less than 60% of original width of seal face shall remain undamaged.</li> </ul>	Any amount repaired that brings face seal within serviceable limits.	Lap repair per WP 404 00. Seal lip height shall be maintained.  Replace face seal assembly exceeding reparable limits.
Scratches extending across sealing face	Up to 0.005 inch deep and 0.010 inch wide	Any amount repaired that brings face seal within serviceable limits.	Lap repair per WP 404 00. Seal lip height shall be maintained.  Replace face seal assembly exceeding reparable limits.
Deterioration (crumbling of carbon)	Not serviceable	Not reparable	Replace face seal assembly.
Cracks	Not serviceable	Not reparable	Replace face seal assembly.
Circular wear marks caused by rubbing mating surface	Any amount is serviceable.	-	-
Freedom of movement	Push in on sealing surface by hand. It shall return to original position without binding or dragging.	Not reparable	Replace face seal assembly.

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Sealing surface - (continued)			
Freedom of movement under torque load	Push carbon element in and out while applying a torque load clockwise. Replace seal if carbon element does not move freely.	Not reparable	Replace face seal assembly.
Wear (seal lip height) (PNs 4009751, 4009752, 4040237, 4040245, 4040245)	0.025 inch minimum height	Not reparable	Replace face seal assembly.
Surface finish	0.00003 inch	Seal lip height serviceable limit shall be maintained.	Lap repair per WP 404 00.
(PNs 4065385 and 4065596) Inspect using optical flats. Refer to T.O. 2J-F100-53-1, SWP 091 06.	0.000035 inch		
2. Other areas -			
Cracks	Not serviceable	Not reparable	Replace face seal assembly.
Nicked and raised metal	Not serviceable	See corrective action	Hand blend with fine abrasive stone to remove raised metal.

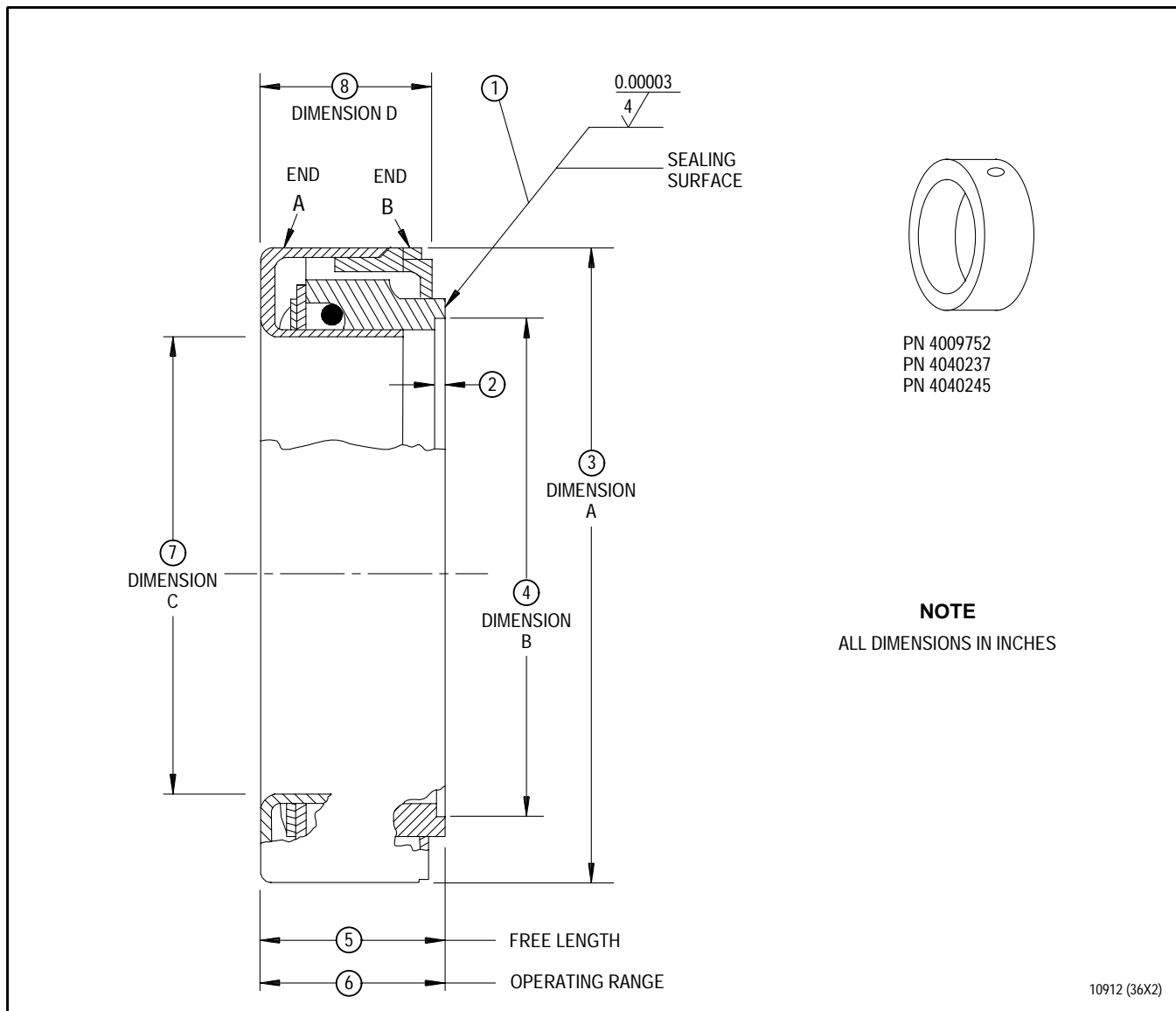


Figure 2. Gearbox Seal Assemblies (PN 4009752, 4040237, and 4040245) - Inspection

## Legend for figure 2

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
(PN 4009752)			
1. Sealing surface -			
Total face load	1.5 pounds minimum at 0.686 inch length; 4.5 pounds maximum at 0.626 inch length	Not reparable	Replace face seal assembly.
2. Seal lip height -	Not applicable	-	-
3. Dimension A - out-of-round	1.626 to 1.628 inch average diameter. Out-of-round in excess of tolerance shown may vary uniformly from 0.002 inch at End A to 0.008 inch at End B.	Not reparable.	Replace face seal assembly.
4. Dimension B -	1.157 to 1.161 inch diameter	Not reparable	Replace face seal assembly.
5. Free length	Not applicable	-	-
6. Operating range -	0.626 to 0.686 inch	Not reparable	Replace face seal assembly.
7. Dimension C -	1.050 to 1.055 inch diameter	Not reparable	Replace face seal assembly.
8. Dimension D -	0.620 inch maximum height	Not reparable	Replace face seal assembly.

## Legend for figure 2 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
(PN 4040237)			
1. Sealing surface -			
Total face load	1.125 pounds minimum at 0.686 inch length; 4.250 pounds maximum at 0.626 inch length.	Not reparable	Replace face seal assembly.
2. Seal lip height -	0.025 inch minimum	Not reparable	Replace face seal assembly.
3. Dimension A - out-of-round	1.626 to 1.628 inch average diameter. Out-of-round in excess of tolerance shown may vary uniformly from 0.002 inch at End A to 0.008 inch at End B.	Not reparable	Replace face seal assembly.
4. Dimension B -	1.157 to 1.167 inch diameter	Not reparable	Replace face seal assembly.
5. Free length -	0.693 inch minimum	Not reparable	Replace face seal assembly.
6. Operating range -	0.626 to 0.686 inch	Not reparable	Replace face seal assembly.
7. Dimension C -	1.050 to 1.055 inch diameter	Not reparable	Replace face seal assembly.
8. Dimension D -	0.540 inch maximum height	Not reparable	Replace face seal assembly.



## Legend for figure 2 (continued)

Inspection Area - Condition  (PN 4040245)	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Sealing surface -  Total face load	1.75 pounds minimum at 0.686 inch length; 5.50 pounds maximum at 0.626 inch length.	Not reparable	Replace face seal assembly.
2. Seal lip height -	0.172 to 0.203 inch	Not reparable	Replace face seal assembly.
3. Dimension A - out-of-round	1.626 to 1.628 inch average diameter. Out-of-round in excess of tolerance shown may vary uniformly from 0.002 inch at End A to 0.008 inch at End B.	Not reparable	Replace face seal assembly.
4. Dimension B -	1.157 minimum diameter	Not reparable	Replace face seal assembly.
5. Free length	Not applicable	-	-
6. Operating range -	0.626 to 0.686 inch	Not reparable	Replace face seal assembly..
7. Dimension C -	1.050 to 1.055 inch diameter	Not reparable	Replace face seal assembly.
8. Dimension D -	0.620 inch maximum height	Not reparable	Replace face seal assembly.

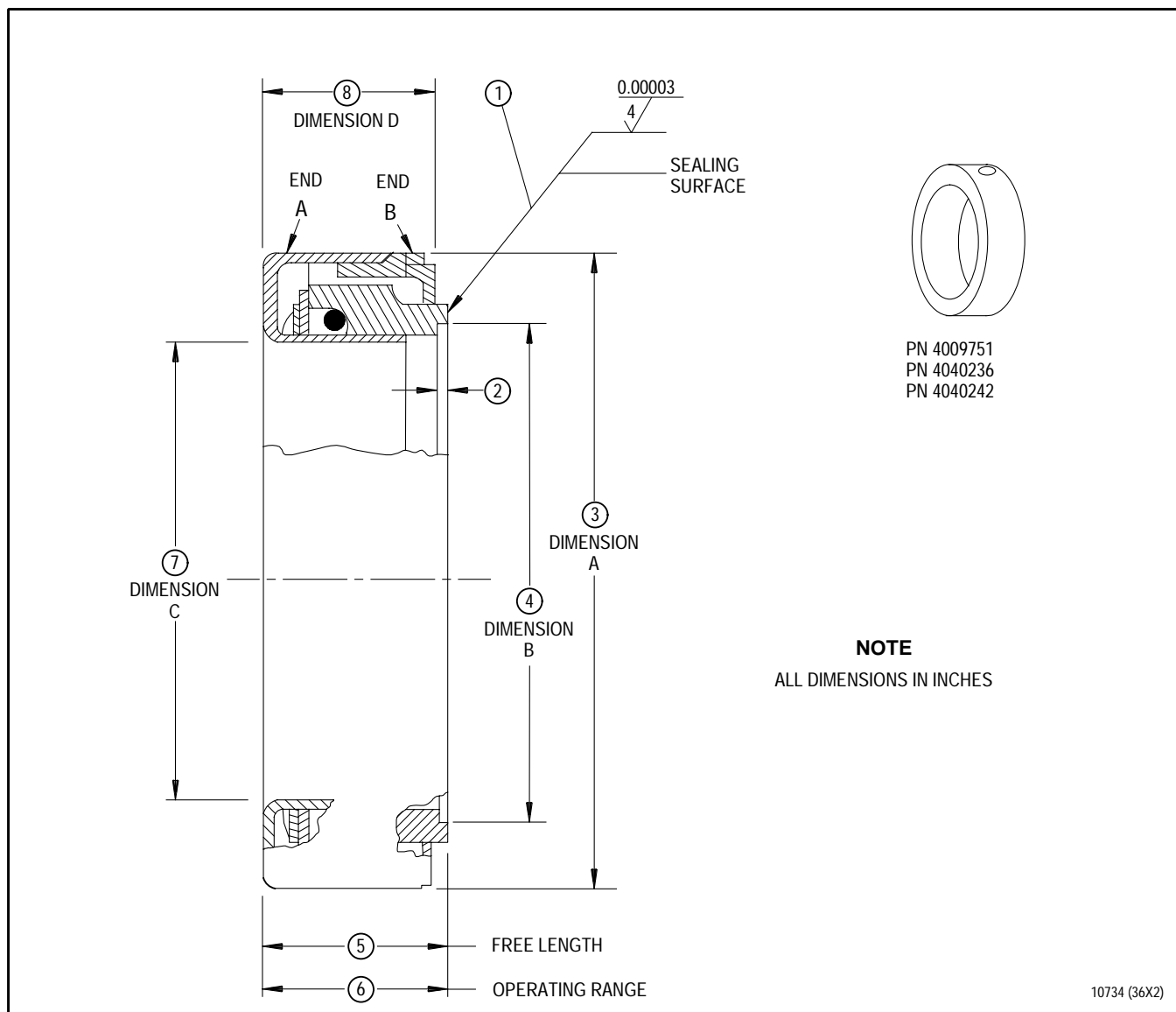


Figure 3. Gearbox Seal Assemblies (PN 4009751, 4040236 and 4040242) - Inspection

## Legend for figure 3

Inspection Area - Condition (PN 4009751)	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Sealing surface -  Total face load	2.0 pounds minimum at 0.757 inch length; 6.25 pounds maximum at 0.647 inch length	Not reparable	Replace face seal assembly.
2. Seal lip height -	0.025 inch minimum	Not reparable	Replace face seal assembly.
3. Dimension A - out-of-round	2.312 to 2.314 inch average diameter. Out-of-round in excess of tolerance shown may vary uniformly from 0.002 inch at End A to 0.008 inch at End B.	Not reparable	Replace face seal assembly.
4. Dimension B -	1.807 to 1.823 inch diameter	Not reparable	Replace face seal assembly.
5. Free length -	0.797 inch minimum	Not reparable	Replace face seal assembly.
6. Operating range -	0.647 to 0.757 inch	Not reparable	Replace face seal assembly..
7. Dimension C -	1.655 to 1.665 inch diameter	Not reparable	Repalce face seal assembly.
8. Dimension D -	0.637 inch maximum height	Not reparable	Replace face seal assembly.

## Legend for figure 3 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
<b>(PN 4040236)</b>			
1. Sealing surface -			
Total face load	1.75 pounds minimum at 0.716 inch length; 5.50 pounds maximum at 0.656 inch length.	Not reparable	Replace face seal assembly.
2. Seal lip height -	Not applicable	-	-
3. Dimension A - out-of-round	2.312 to 2.314 inch average diameter. Out-of-round in excess of tolerance shown may vary uniformly from 0.002 inch at End A to 0.008 inch at End B	Not reparable	Replace face seal assembly.
4. Dimension B -	1.750 to 1.760 inch diameter	Not reparable	Replace face seal assembly.
5. Free length	0.731 inch minimum	Not reparable	Replace face seal assembly.
6. Operating range -	0.656 to 0.716 inch	Not reparable	Replace face seal assembly.
7. Dimension C -	1.650 inch minimum diameter	Not reparable	Replace face seal assembly.
8. Dimension D -	0.587 inch maximum height	Not reparable	Replace face seal assembly.

## Legend for figure 3 (continued)

Inspection Area - Condition  (PN 4040242)	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Sealing surface -  Total face load	2.0 pounds minimum at 0.716 inch length; 6.0 pounds maximum at 0.656 inch length	Not reparable	Replace face seal assembly.
2. Seal lip height -	Not applicable	-	-
3. Dimension A - out-of-round	2.312 to 2.314 inch average diameter. Out-of-round in excess of tolerance shown may vary uniformly from 0.002 inch at End A to 0.008 inch at End B.	Not reparable	Replace face seal assembly.
4. Dimension B -	1.750 to 1.760 inch diameter	Not reparable	Replace face seal assembly.
5. Free length -	0.772 inch minimum	Not reparable	Replace face seal assembly..
6. Operating range -	0.656 to 0.716 inch	Not reparable	Replace face seal assembly.
7. Dimension C -	1.650 inch minimum diameter	Not reparable	Replace face seal assembly.
8. Dimension D -	0.637 inch maximum height	Not reparable	Replace face seal assembly.

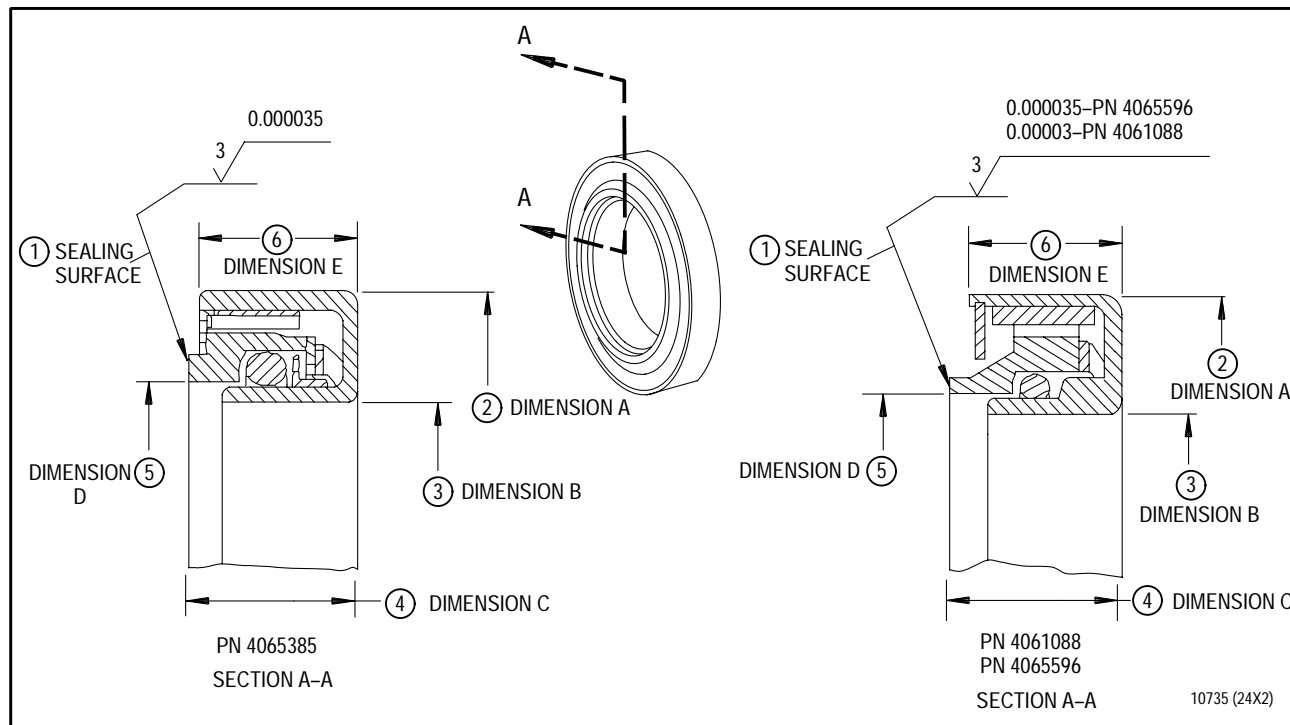


Figure 4. Seal Assembly, Reduction Gearbox (PN 4065385, 4061088 and 4065596) - Inspection

Legend for figure 4

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
<b>(PN 4065385)</b>			
1. Sealing surface -			
Total face load	1.5 pounds minimum at 0.675 inch; 10.8 pounds maximum at 0.575 inch	Not reparable	Replace face seal assembly.
2. Dimension A -	3.253 to 3.255 inch average diameter	Not reparable	Replace face seal assembly.
3. Dimension B -	2.410 inch minimum diameter	Not reparable	Replace face seal assembly.
4. Dimension C - operating range	0.575 to 0.675 inch	Not reparable	Replace face seal assembly.
5. Dimension D -	2.575 to 2.585 inch diameter	Not reparable	Replace face seal assembly.
6. Dimension E -	0.545 to 0.555 inch	Not reparable	Replace face seal assembly.
<b>(PNs 4061088 and 4065596)</b>			
1. Sealing surface -			
Total face load	3.75 pounds minimum at 0.675 inch 9.50 pounds maximum at 0.575 inch	Not reparable	Replace face seal assembly.
2. Dimension A -	3.253 to 3.255 inch average diameter	Not reparable	Replace face seal assembly.
3. Dimension B -	2.410 to 2.420 inch diameter	Not reparable	Replace face seal assembly.

## Legend for figure 4 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
4. Dimension C - operating range	0.575 to 0.675 inch	Not reparable	Replace seal face.
5. Dimension D -	2.501 inch minimum diameter	Not reparable	Replace seal face.
6. Dimension E -	0.545 to 0.555 inch	Not reparable	Replace seal face.



WP 307 00 Deleted



**WP 308 00 Deleted**



# WORK PACKAGE

## TECHNICAL PROCEDURES

### SEAL SEAT, REDUCTION GEARBOX BEARING -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 5 . . . . .	0				
6 Blank . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Optical Flatness Check of Main Bearing Carbon Seals, Seal Plates, and Spacers - - - - -	SWP 091 06

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

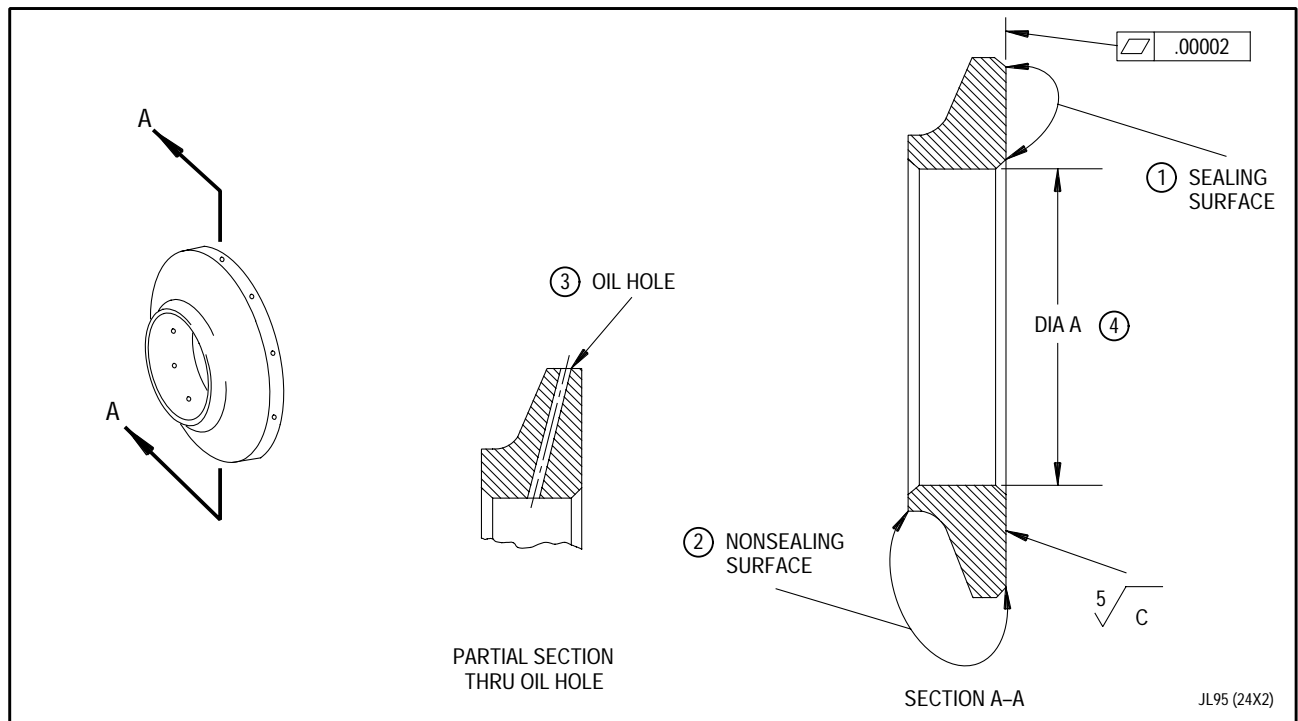
- a. This work package contains instructions for inspection of reduction gearbox bearing seal seat (PN 4066397).

**2. REDUCTION GEARBOX BEARING SEAL SEATS - INSPECTION.**

(See Figure 1.)

- a. Magnetic particle inspect seal seat. Refer to T.O. 2J-F100-9. No cracks allowed.

- b. Inspect seal seats. (See figure 1.) Inspect surface finish and flatness using profilometer (Micrometrical Division of Bendix Corporation, Ann Arbor, Michigan, or equivalent). Refer to T.O. 2J-F100-53-1, SWP 091 06.



**Figure 1. Reduction Gearbox Bearing Seal Seat - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Sealing surface -			
Pitting	Widely scattered - pitting is acceptable.	-	-
Scratches extending across sealing face	Depth 0.005 inch width 0.010 inch	See corrective action.	Lap sealing surface per WP 409 00. Repair damage that cannot be corrected by lapping per WP 409 00.
Surface burrs	Not serviceable	See corrective action.	Lap sealing surface per WP 409 00. Repair damage that cannot be corrected by lapping per WP 409 00.
Nicks and dents	Not serviceable	See corrective action.	Lap sealing surface per WP 409 00. Repair damage that cannot be corrected by lapping per WP 409 00.
Surface finish and flatness	See figure 1.	See corrective action.	Lap sealing surface per WP 409 00. Repair damage that cannot be corrected by lapping per WP 409 00.
Cracks	Not serviceable	Not repairable	Replace seal seat.



## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
2. Nonsealing surfaces -			
Cracks	Not serviceable	Not repairable	Replace seal seat.
Nicks, dents, burrs	Not serviceable	0.030 inch deep	Deburr per WP 409 00.
3. Oil holes -			
Blocked	Not serviceable	Any amount	Remove obstruction per WP 409 00.
4. Diameter A -			
Wear	1.7320 inch diameter	1.7420 inch diameter	Repair seal seat per WP 409 00.
Galling, fretting and axial scoring	Not serviceable	1.5390 inch diameter	Repair seal seat per WP 409 00.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### HOUSING ASSEMBLY, GEARBOX (REAR) -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 11 . . . . .	0				
12 Blank . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Engine - - - - -	T.O. 2J-F100-53-5
Table of Limits and Clearance Charts - - - - -	WP 801 00
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Table of Limits and Clearance Charts - - - - -	WP 801 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

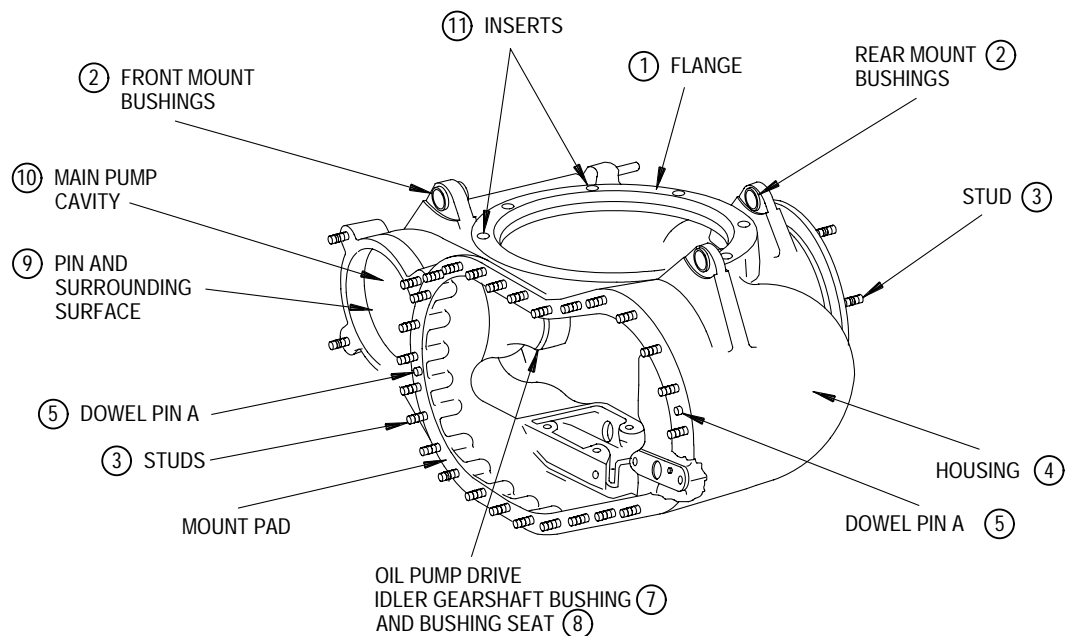
## **1. INTRODUCTION.**

- a. This work package contains instructions for inspection of gearbox (rear) housing assembly.

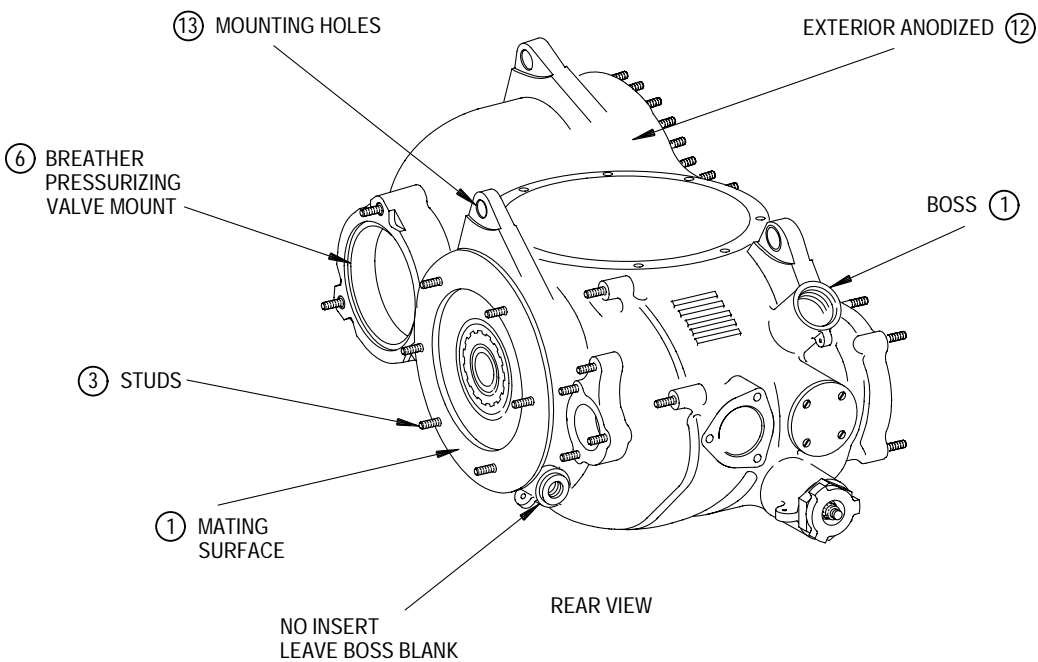
## **2. GEARBOX (REAR) HOUSING ASSEMBLY - INSPECTION.**

(See Figure 1.)

- a. Fluorescent penetrant inspect housing. Refer to T.O. 2J-F100-9. No cracks allowed.
- b. Inspect housing. (See figure 1.)



FRONT VIEW



REAR VIEW

JL010586 (48X2)

Figure 1. Gearbox (Rear) Housing Assembly - Inspection

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Bosses, flanges mating surfaces -			
High metal, pickup	Not serviceable	See corrective action.	Blend repair. Remove high metal.
Damaged threads	Not serviceable	Not repairable	Weld repair. Refer to WP 402 00.
2. Rear mount bushing -			
Wear, surface defects	Refer to T.O. 2J-F100-53-5, WP 801 00, References 12 and 17.	See corrective action.	Replace bushing. Refer to WP 402 00.
3. Stud -			
Damaged threads two or less	Not serviceable	Maximum of two entrance threads, may be removed.	Clean up threads.
Damaged threads, more than two	Not serviceable	See corrective action.	Replace stud. Refer to WP 402 00.
Looseness	Not serviceable	See corrective action.	Replace stud. Refer to WP 402 00.

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
4. Housing -			
Cracks, outer wall	Not serviceable	4.0 inches per crack, total 12.0 inches on housing.	Weld repair. Refer to WP 402 00.
Cracks, mount lugs	Not serviceable	4.0 inches per crack, total 12.0 inches on housing.	Weld repair. Refer to WP 402 00.
Cracks, main top mount flange	Not serviceable	4.0 inches per crack, total 12.0 inches on housing.	Weld repair. Refer to WP 402 00.
Cracks, main top flange preformed packing ring groove and main pilot diameter	Not serviceable	4.0 inches per crack, total 12.0 inches on housing.	Weld repair. Refer to WP 402 00.
Cracks, main fuel pump mount pad face	Not serviceable	4.0 inches per crack, total 12.0 inches on housing.	Weld repair. Refer to WP 402 00.
Cracks, deaerator impeller shaft rear bearing and breather pressurizing valve pad.	Not serviceable	4.0 inches per crack, total 12.0 inches on housing.	Weld repair. Refer to WP 402 00.



## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
5. Dowel Pin A - Broken, loose	Not serviceable	See corrective action.	Replace pins. Refer to WP 402 00.
Projection length	0.115 to 0.135 inch	See corrective action.	If projection length is excessive, attempt to seat pin. Refer to WP 402 00.
6. Breather pressurizing valve mount - Worn diameter	Not serviceable	See corrective action.	Plate repair. Refer to WP 402 00.

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
7. Oil pump drive idler gearshaft bushing -			
Wear, surface defects	Refer to WP 801 00, Reference 5319.	See corrective action.	Replace bushing, Refer to WP 402 00.
Oil pump drive idler gearshaft diameter at opposite end of bushing -			
Loose	Refer to WP 801 00, References 5318 and 5323.	See corrective action.	Repair housing and replace bushing. Refer to WP 402 00.
8. Oil pump drive idler gearshaft bushing - seat			
Scored surface or scored inside diameter bottom where oil pump drive idler gearshaft bushing is installed.	Not serviceable	Not repairable	Repair housing and replace bushing. Refer to WP 402 00.

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
9. Pin and surrounding surface -			
Broken, loose	Not serviceable	See corrective action.	Replace pin, or weld repair. Refer to WP 402 00.
Projection length	0.180 to 0.200 inch	See corrective action.	If projection length is excessive, attempt to seat pin. Refer to WP 402 00.
Surrounding surface	0.250 to 0.282 inch free of missing metal around pin diameter	Cavities in surface outside of 0.250 to 0.282 inch area shall not be more than 0.030 inch deep. Variation of cavity length(s) and width(s) may extend to housing wall radius and edge of seat surface.	Blend repair. Refer to WP 402 00.

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
10. Main pump cavity -			
Corrosion, flaking, peeling	Not serviceable	See corrective action.	Recoat. Refer to WP 402 00.
Wear	Refer to WP 801 00, Reference 5347.	See corrective action.	Recoat. Refer to WP 402 00.
Dowel pin boss - Damage	Not serviceable	0.500 inch diameter and 0.075 inch deep.	Blend to remove sharp edges.
11. Inserts -			
Broken, loose, damaged threads	Not serviceable	See corrective action.	Replace insert. Refer to WP 402 00.
Broken, loose, not replaceable with normal size insert	Not serviceable	Replaceable within oversize tap limits	Replace housing.
Broken, loose, not replaceable with oversize insert	Not serviceable	See corrective action.	Replace housing.

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
12. Exterior anodized -  Bared surface	Not serviceable	See corrective action.	Paint or touch up surface as required. Refer to T.O. 2J-F100-53-1, SWP 092 16.
13. Mounting holes -  Galling	Refer to WP 801 00, Reference 5369.	Not reparable	Replace housing.
Nicks, scratches	0.005 inch depth, provided there is no raised metal	Not reparable	Replace housing.
14. Company name plate -  Loose	Not serviceable	See corrective action.	Secure. Refer to WP 402 00.
Loose, damaged screw threads	Not serviceable	See corrective action.	Replace housing.
Damaged or missing	Not serviceable	Not reparable.	Replace name plate. Refer to WP 402 00.
15. Identification plate -  Loose	Not serviceable	See corrective action.	Tighten screws. Refer to WP 402 00.
Damaged	Not serviceable	See corrective action	Replace plate. Refer to WP 402 00.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### HOUSING ASSEMBLY, REDUCTION GEARBOX -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	.	.	.	.	1
2	-	5	.	.	0
6	.	.	.	.	1

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None



**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of reduction gearbox housing assembly.

**2. REDUCTION GEARBOX HOUSING  
ASSEMBLY - INSPECTION.**

(See Figure 1.)

- a. Fluorescent penetrant inspect housing. Refer to T.O. 2J-F100-9. No cracks allowed.
- b. Inspect housing. (See figure 1.)

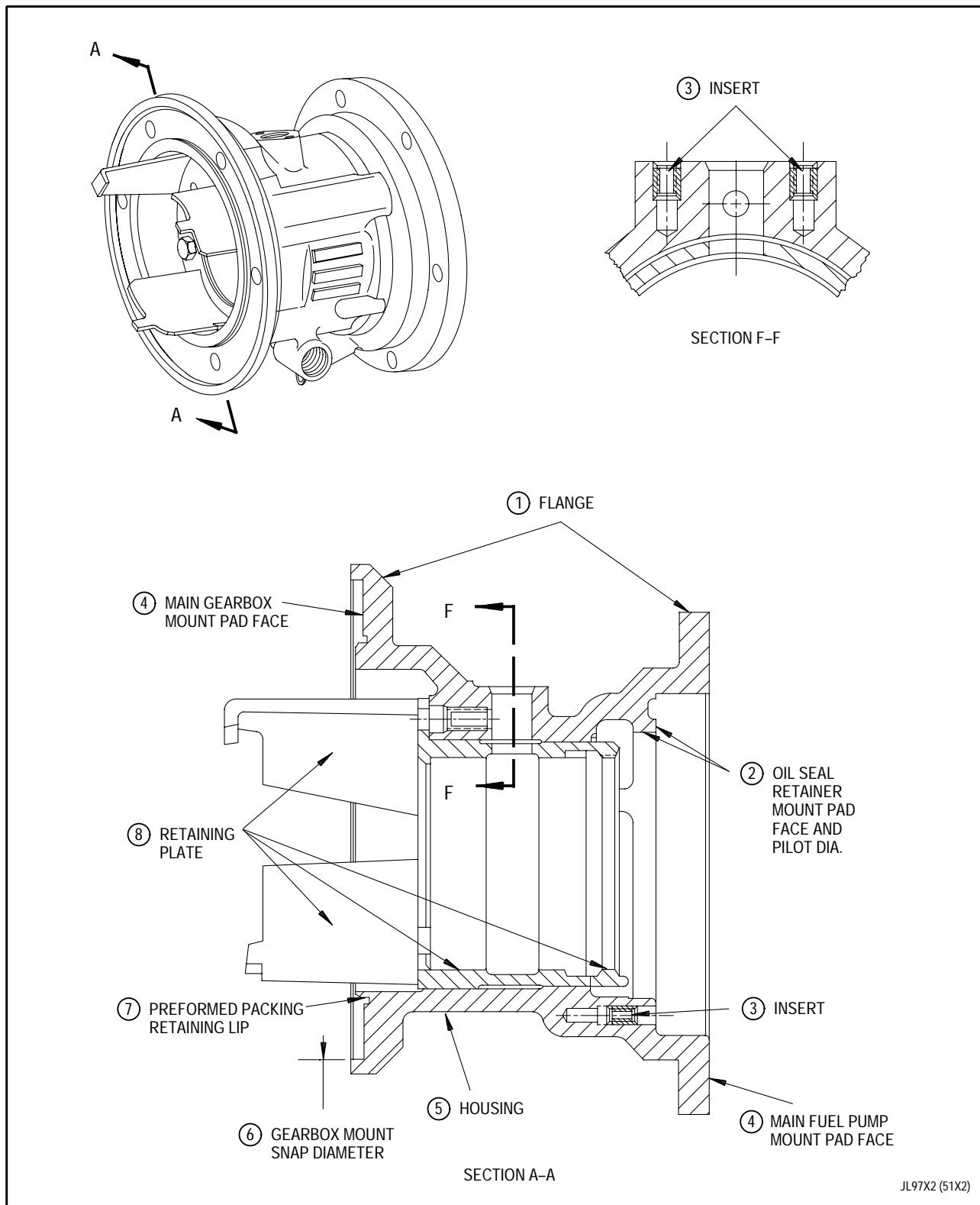


Figure 1. Reduction Gearbox Housing Assembly - Inspection

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Flange -  High metal, pickup	Not serviceable	See corrective action.	Remove high metal.
2. Oil seal retainer mount pad face and pilot diameter -  Cracks	Not serviceable	Not repairable.	Replace housing.
3. Insert -  Broken, loose, damaged threads	Not serviceable	See corrective action.	Replace insert.
Broken, loose, not replaceable with normal size insert	Not serviceable	Replaceable within oversize tap limits.	Replace with oversize insert.
Broken, loose, not replaceable with oversize insert	Not serviceable	See corrective action.	Replace with insert.
4. Main fuel pump mount pad face and main gearbox mount pad face -  Cracks	Not serviceable	Not repairable.	Replace housing.

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
5. Housing -			
Cracks, outer wall	Not serviceable	See corrective action.	Replace housing.
Exterior anodize			
Bared surface - Nicks, scratches	Not serviceable	See corrective action.	Hand blend with abrasive stone to remove high metal. Paint or touch up surface as required. Refer to T.O. 2J-F100-53-1, SWP 092 16.
6. Gearbox mount snap diameter -			
Wear, galling	Not serviceable	Not repairable.	Replace housing.
7. Preformed packing retaining lip -			
Cracks	Not serviceable	Not repairable.	Replace housing.
Rolled metal	Not serviceable	Not repairable.	Replace housing.
8. Retaining plate -			
Scored surface or scored inside diameter	Not serviceable	See corrective action.	Stone high metal.
Bent, broken tangs	Not serviceable	See corrective action.	Replace housing or replace plate.

**WORK PACKAGE****TECHNICAL PROCEDURES****HOUSING ASSEMBLY, GEARBOX (FRONT) -****INSPECTION****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 6

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 5 . . . . .					
6 Blank . . . . .					

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Table of Limits and Clearance Charts - - - - -	WP 801 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

## 1. INTRODUCTION.

- a. This work package contains instructions for inspection of gearbox (front) housing assembly.

## 2. GEARBOX (FRONT) HOUSING ASSEMBLY - INSPECTION.

(See Figure 1.)

- a. Fluorescent penetrant inspect housing. Refer to T.O. 2J-F100-9.

- b. Inspect housing assembly. (See figure 1.)

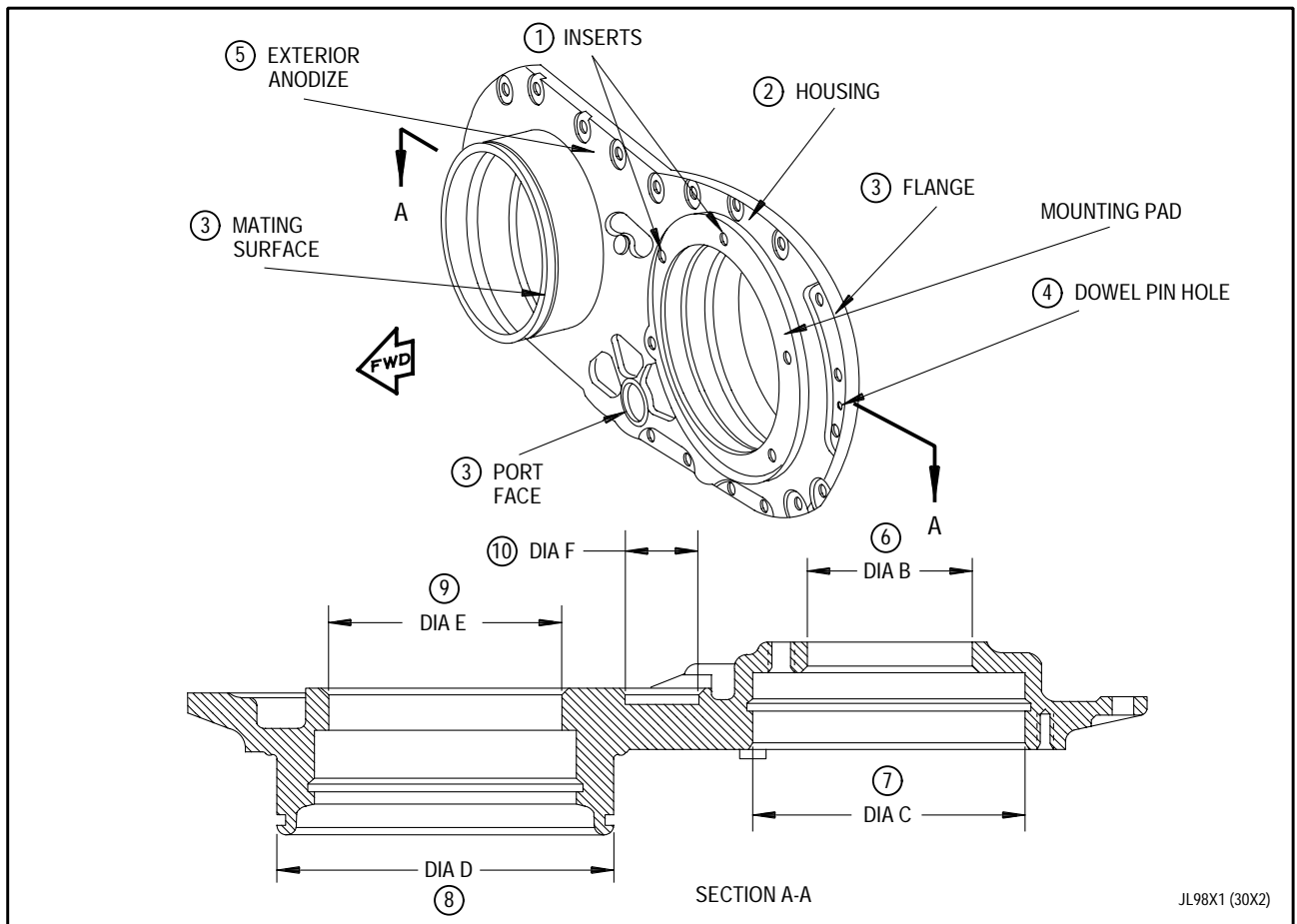


Figure 1. Gearbox (Front) Housing Assembly - Inspection

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Inserts - Broken, loose, damaged threads	Not serviceable	See corrective action.	Replace insert. Refer to WP 412 00.
2. Housing (all areas) - Cracks	Not serviceable	Not repairable	Replace housing.
3. Port face, flanges (mating surfaces) - High metal pickup	Not serviceable	See corrective action.	Remove high metal. Refer to WP 412 00.
4. Dowel pin hole - Oversize or deformed	0.252 inch diameter maximum	0.3117 inch diameter maximum	Machine new hole. Refer to WP 412 00.
5. Exterior anodize - Bared	Not serviceable	See corrective action.	Paint or touch up surface. Refer to WP 412 00.
6. Diameter B - Wear	Refer to WP 801 00, Reference 5306.	See corrective action.	Repair snap diameter. Refer to WP 412 00.
7. Diameter C - Wear	None	See corrective action.	Repair snap diameter. Refer to WP 412 00.
8. Diameter D - Wear	0.035 inch deep over 30% of casting circumference.	See corrective action.	Replace housing.



## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
9. Diameter E - Wear	Refer to WP 801 00, Reference 5314.	See corrective action.	Repair snap diameter. Refer to WP 412 00.
10. Diameter F - Wear	Refer to WP 801 00, Reference 5308.	See corrective action.	Repair snap diameter. Refer to WP 412 00.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARSHAFT, SPUR, GEARBOX -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
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REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Maintenance Instruction, Depot, Gearbox Module - - - - -	T.O. 2J-F100-53-11
Bearings, Gearbox/Reduction Gearbox Inspection - - - - -	WP 303 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

## 1. INTRODUCTION.

- a. This work package contains instructions for inspecting gearbox spur gearshaft.

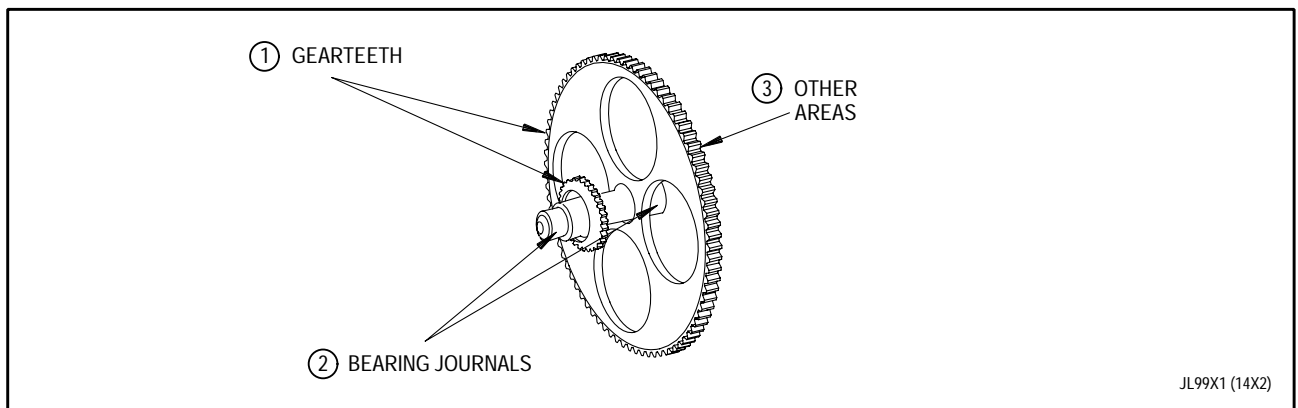
## 2. GEARBOX SPUR GEARSHAFT - INSPECTION.

(See Figure 1.)

- a. Nondestructive inspect. Refer to T.O. 2J-F100-9.

- b. Inspect gearshaft. (See figure 1.)

- c. If gearteeth(1) have spalling over acceptable limits, both main oil pump idler bearings (PN 4003686 or 4057332) shall be replaced. Refer to WP 303 00.



**Figure 1. Gearbox Spur Gearshaft - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Gearteeth -			
Surface damage and high spots	None	0.002 inch deep	Repair (stone) high spots. Refer to WP 413 00.
Pitting and spalling (larger gear, 99 teeth)	0.010 inch deep provided pit is 0.025 inch from any tooth edge and longest dimension across pit does not exceed 0.020 inch.	See corrective action.	Repair (stone). Refer to WP 413 00.
Pitting and spalling (smaller gear, 23 teeth)	Not serviceable unless gear has been previously silver flashed. Part is serviceable up to maximum repairable limits if previously silver flashed.	Pitting due to spalling repairable up to 0.008 inch depth and any width, maximum of one pit per tooth.	Repair (silver flash). Refer to WP 413 00.
2. Bearing journals -			
Axial scratches	0.010 inch deep provided tolerances for proper assembly are not affected	See corrective action.	Machine journals. Refer to WP 413 00.
Wear	Not serviceable	See corrective action.	Plate/machine. Refer to WP 413 00.
3. Other areas -			
Nicks, dents, and scratches	Not serviceable	See corrective action.	Polish. Refer to WP 413 00.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARSHAFT ASSEMBLY, BEVEL, SPUR, GEARBOX DRIVE -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

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2	-	4	.	.	0
5	.	.	.	.	1
6	.	.	.	.	0

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None



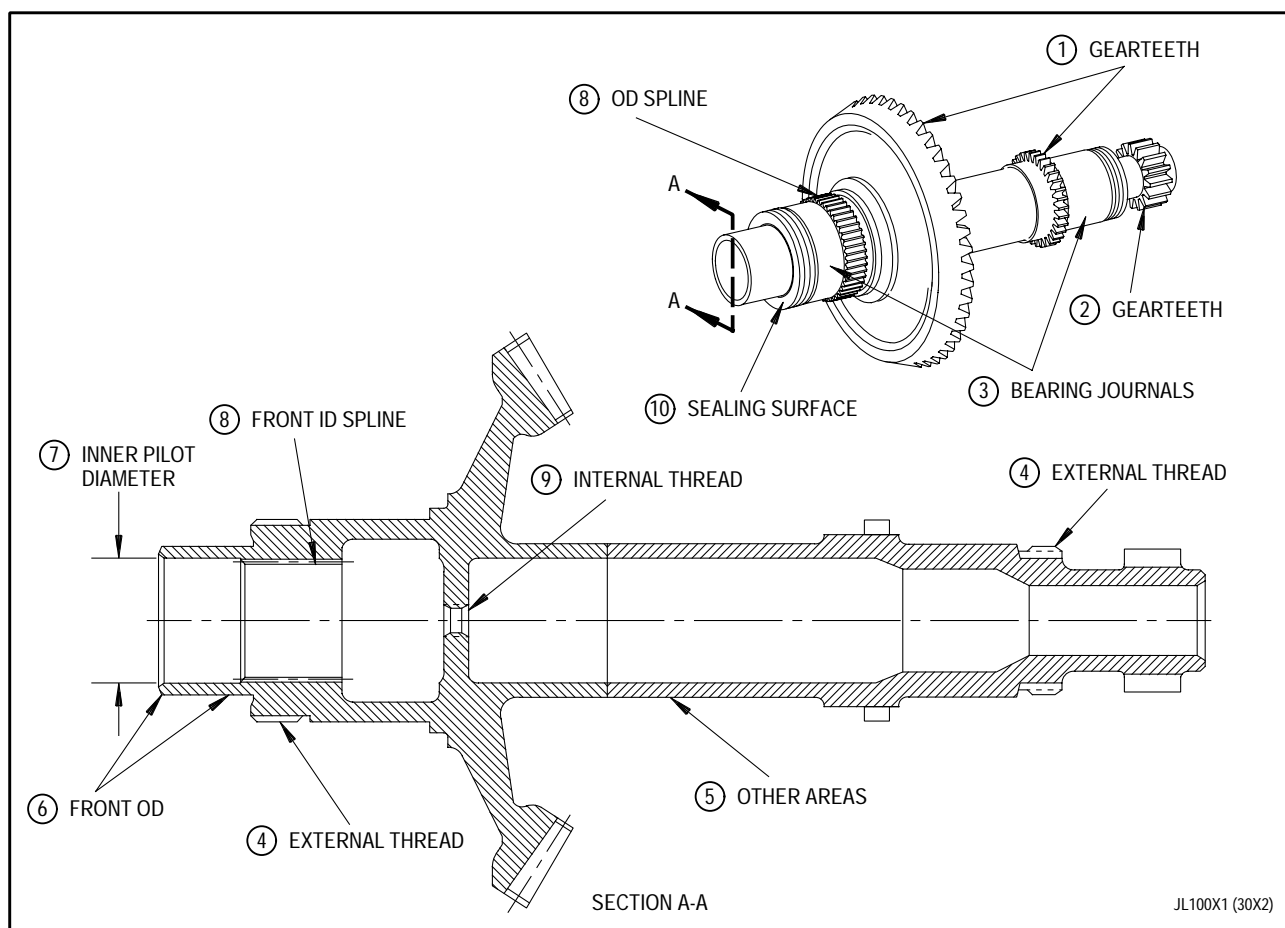
## 1. INTRODUCTION.

- a. This work package contains instructions for inspecting gearbox drive spur bevel gearshaft.

## 2. GEARBOX DRIVE SPUR BEVEL GEARSHAFT - INSPECTION.

(See Figure 1.)

- a. Nondestructive inspect. Refer to T.O. 2J-F100-9.
- b. Inspect gearshaft. (See figure 1.)



**Figure 1. Gearbox Drive Spur Bevel Gearshaft - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Gearteeth -			
<b>NOTE</b>			
Silver flash is applied for initial run-in of new gears. Residual silver flash on gears after run-in is normal and acceptable. Wear limits should apply to parent metal only.			
Surface damage and high spots	None	0.002 inch deep	Blend (stone) high spots. Refer to WP 414 00.
Pitting and spalling	0.010 inch deep provided pit is 0.025 inch from any tooth edge and longest dimension across pit does not exceed 0.020 inch.	See corrective action.	Blend per WP 414 00.
2. Gearteeth -			
Surface damage and high spots	None	0.002 inch deep	Blend (stone) high spots. Refer to WP 414 00.
Pitting and spalling	None	Not applicable	Not applicable
Wear on silver flash	Wear through to parent material is acceptable.	Not applicable	Not applicable

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
3. Bearing journals -			
Axial scratches	0.010 inch deep provided tolerances for proper assembly are not affected	See corrective action.	Plate/machine journals per WP 414 00.
Wear, galling, fretting	Not serviceable	See corrective action.	Plate/machine per WP 414 00.
4. External threads -			
High metal, nicks, dents	Not serviceable	All thread pickup and high metal. Excessive damage first thread only.	Blend repair per WP 414 00.
5. Other areas -			
Nicks, dents, and scratches	Not serviceable	See corrective action.	Repair per WP 414 00.
6. Front OD -			
Worn nickel plate	Not serviceable	See corrective action.	Nickel plate per WP 414 00.
7. Inner pilot diameter -			
Wear	1.3728 to 1.3750 inch diameter	1.390 inch diameter	Nickel plate per WP 414 00.

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
8. Front ID and OD splines -			
Wear (Check using surface plate, Vee blocks and standard indicator gage.)	OD spline wear - 0.010 inch	See corrective action.	Nickel plate. Refer to WP 414 00.
	Front ID spline wear 0.005 inch	See corrective action.	Nickel plate. Refer to WP 414 00.
9. Internal threads -			
High metal or thread pickup	Not serviceable	All thread pickup and high metal. Excessive damage first two threads only.	Retap threads. Refer to WP 414 00.
10. Sealing surface -			
Pitting	Widely scattered pitting is acceptable	Not applicable	Not applicable
Scratches extending across sealing face	Depth 0.005 inch Width 0.010 inch	See corrective action.	Chromium plate. Refer to WP 414 00.
Surface burrs	None	See corrective action.	Lap. Refer to WP 414 00.
Nicks and dents	None	See corrective action.	Lap. Refer to WP 414 00.

# WORK PACKAGE

## TECHNICAL PROCEDURES

GEAR, INTERNAL, MAIN FUEL PUMP DRIVE -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 5 . . . . .	0				
6 Blank . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

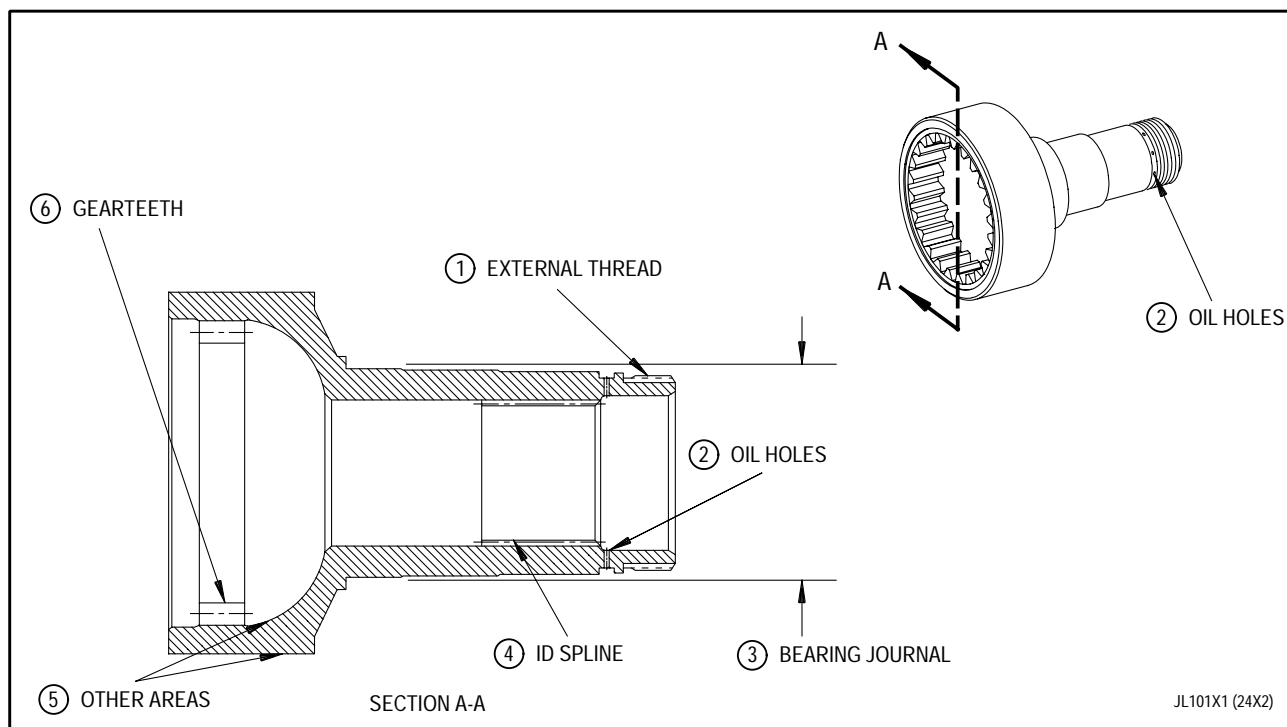
- a. This work package contains instructions for inspecting main fuel pump drive internal gear.

**2. MAIN FUEL PUMP DRIVE, INTERNAL GEAR - INSPECTION.**

(See Figure 1.)

- a. Nondestructive inspect. Refer to T.O. 2J-F100-9.

- b. Inspect gear. (See figure 1.)



**Figure 1. Main Fuel Pump Drive, Internal Gear - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. External thread -  High metal, nicks, dents	Not serviceable	All thread pickup and high metal. Excessive damage first thread only.	Blend repair. Refer to WP 415 00.
2. Oil holes -  Blocked	Not serviceable	See corrective action.	Remove obstruction.
3. Bearing journals -  Axial scratches	0.010 inch deep provided tolerances for proper assembly are not affected	See corrective action.	Repair. Refer to WP 415 00.
Wear	Not serviceable	See corrective action.	Repair. Refer to WP 415 00.
4. ID Splines -  Wear, (Check using surface plate, Vee blocks and standard indicator gage.)	0.005 inch	See corrective action.	Replace gearshaft.
5. Other areas -  Nicks, dents, and scratches	Not serviceable	See corrective action.	Repair. Refer to WP 415 00.



## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
6. Gearteeth -			
Surface damage and high spots	Not serviceable	0.002 inch deep	Blend (stone) high spots.
Pitting spalling	Not serviceable	See corrective action.	Replace main fuel pump drive gear.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### SHAFT, GEARBOX IDLER GEAR -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

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REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

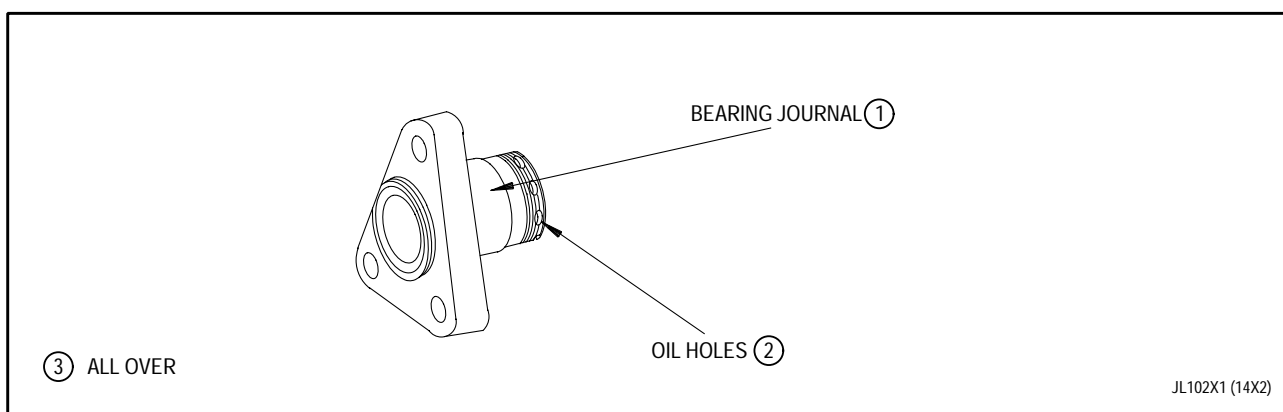
- a. This work package contains instructions for inspecting gearbox idler gearshaft.

**2. GEARBOX IDLER GEARSHAFT - INSPECTION.**

(See Figure 1.)

- a. Magnetic particle inspect.  
Refer to T.O. 2J-F100-9. No cracks allowed.

- b. Inspect shaft. (See figure 1.)



**Figure 1. Gearbox Idler Gearshaft**

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Bearing journal - Axial scratches	0.010 inch deep provided tolerances for proper assembly are not affected.	See corrective action.	Plate/machine journals. Refer to WP 416 00.
Wear	Not serviceable	See corrective action.	Plate/machine journals. Refer to WP 416 00.
2. Oil holes - Blocked	Not serviceable	See corrective action.	Remove obstruction. Refer to WP 416 00.
3. All over Nicks, dents, and scratches	Not serviceable	See corrective action.	Blend repair. Refer to WP 416 00.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### SHAFT, GEARBOX DEAERATOR IMPELLER -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 . . . . .	20	3 . . . . .	20	4 . . . . .	1
2 . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None



**1. INTRODUCTION.**

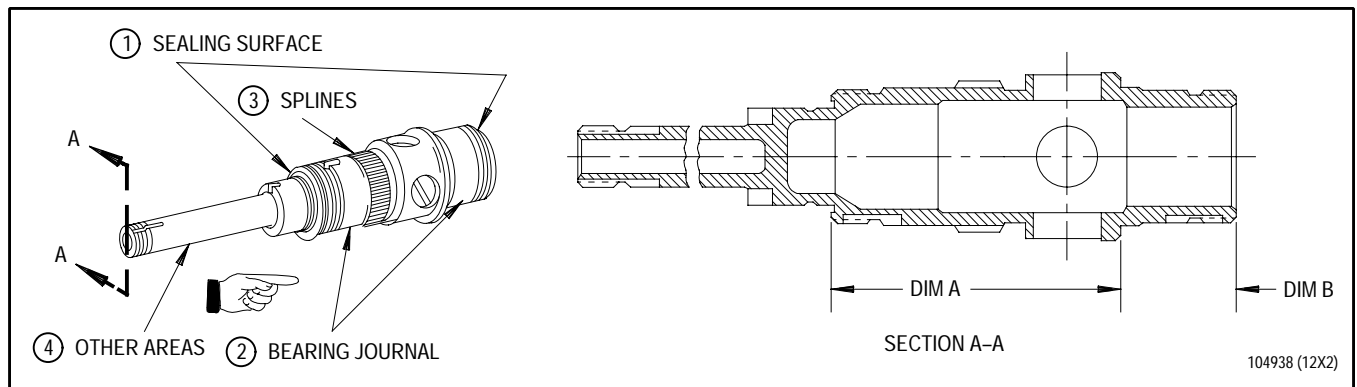
- a. This work package contains instructions for inspecting gearbox deaerator impeller shaft.

**2. GEARBOX DEAERATOR IMPELLER SHAFT - INSPECTION.**

(See Figure 1.)

- a. Magnetic particle inspect.  
Refer to T.O. 2J-F100-9. No cracks allowed.

- b. Inspect shaft. (See figure 1.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Sealing surface -			
Pitting	Widely scattered pitting is acceptable	See corrective action.	Chromium plate sealing surfaces. Refer to WP 417 00.
Scratches extending across sealing face	Depth 0.005 inch Width 0.010 inch	See corrective action.	Chromium plate sealing. Refer to WP 417 00.
Surface burrs	None	See corrective action.	Blend repair. Refer to WP 417 00.

**Figure 1. Gearbox Deaerator Impeller Shaft - Inspection**

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Sealing surface - (continued)			
Nicks and dents	None	See corrective action.	Blend repair per WP 417 00.
Wear	Dim A - 3.098 inches minimum	3.0945 inches	Chromium plate repair per WP 417 00.
	Dim B - 0.988 inch minimum	0.9825 inch	Chromium plate repair per WP 417 00.
2. Bearing journal -			
Axial scratches	0.010 inch deep	See corrective action.	Machine bearing journals per WP 417 00.
Wear	Not serviceable	See corrective action.	Plate/machine bearing journals per WP 417 00.
3. Splines -			
Wear (Check using surface plate, Vee blocks and standard indicator gage.)	External spline wear - 0.010 inch Internal spline wear - 0.005 inch	Not reparable	Replace gearbox deaerator impeller shaft.
4. Other areas -			
Nicks, dents, and scratches	Not serviceable	See corrective action.	Blend.repair per WP 417 00.
Threads -			
Damaged	Not serviceable	Minor damage reparable	Hand blend with fine abrasive stone to remove thread pickup and raised metal.
Any Location -			
Blue color	None	None	Acceptable

# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARSHAFT, BEVEL, GEARBOX ASSEMBLY -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

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REFERENCE MATERIAL REQUIRED

Title	Number
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APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

- a. This work package contains instructions for inspecting gearbox bevel gearshaft.

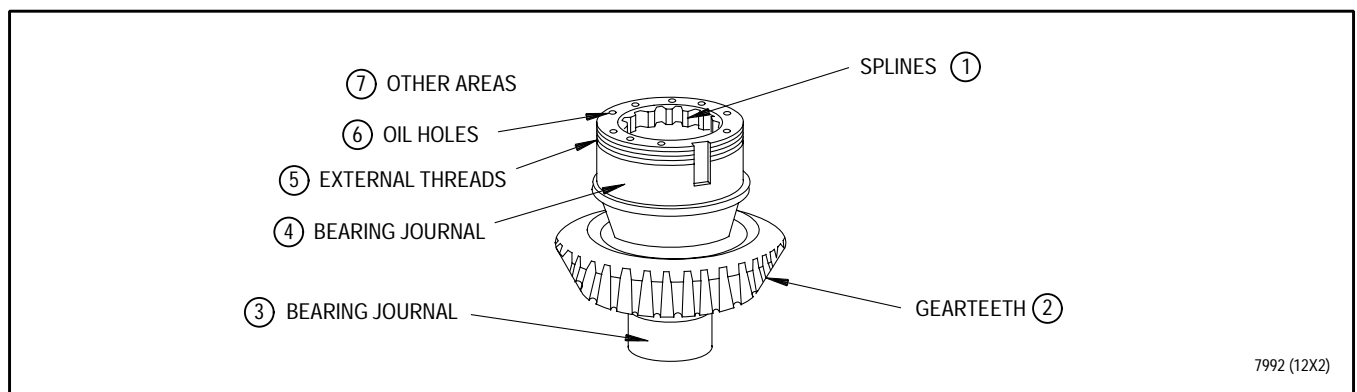
- b. Magnetic particle inspect.  
Refer to T.O. 2J-F100-9. No cracks allowed.

- c. Inspect gearshaft. (See figure 1.)

**2. GEARBOX BEVEL GEARSHAFT - INSPECTION.**

(See Figure 1.)

- a. Attach PWA 52600 magnetizing fixture to induced current machine.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Splines -			
Wear (Check using surface plate, Vee blocks and standard indicator gage.)	External spline wear - 0.010 inch. Internal spline wear - 0.005 inch.	Not repairable	Replace gearshaft.
2. Gearteeth -			
Surface damage and high spots	None	0.002 inch deep	Blend. Refer to WP 418 00.
Pitting and spalling	0.010 inch depth provided pit is 0.025 inch from any tooth edge and longest dimension across pit does not exceed 0.020 inch	See corrective action.	Blend. Refer to WP 418 00.

**Figure 1. Gearbox Bevel Gearshaft - Inspection**

## Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
3. Bearing journal -			
Axial scratches	0.010 inch depth provided tolerances for proper assembly are not affected.	See corrective action.	Machine journals. Refer to WP 418 00.
Wear	1.3780 to 1.3784 inch diameter.	See corrective action.	Plate/machine journals. Refer to WP 418 00.
4. Bearing journal -			
Axial scratches	0.010 inch depth provided tolerances for proper assembly are not affected.	See corrective action.	Machine journals. Refer to WP 418 00.
Wear	2.5598 to 2.5603 inch diameter.	See corrective action.	Plate/machine journals. Refer to WP 418 00.
5. External threads -			
High metal nicks, dents	Not serviceable	All thread pickup and high metal. Excessive damage first thread only.	Blend repair. Refer to WP 418 00.
6. Oil holes -			
Blocked	Not serviceable	See corrective action.	Remove obstruction. Refer to WP 418 00.
7. Other areas -			
Nicks, dents, and scratches	Not serviceable	See corrective action.	Blend. Refer to WP 418 00.

# WORK PACKAGE

## TECHNICAL PROCEDURES

GEAR, SPUR, GEARBOX (GEARBOX DRIVE SPUR BEVEL GEARSHAFT) -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

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REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None



**1. INTRODUCTION.**

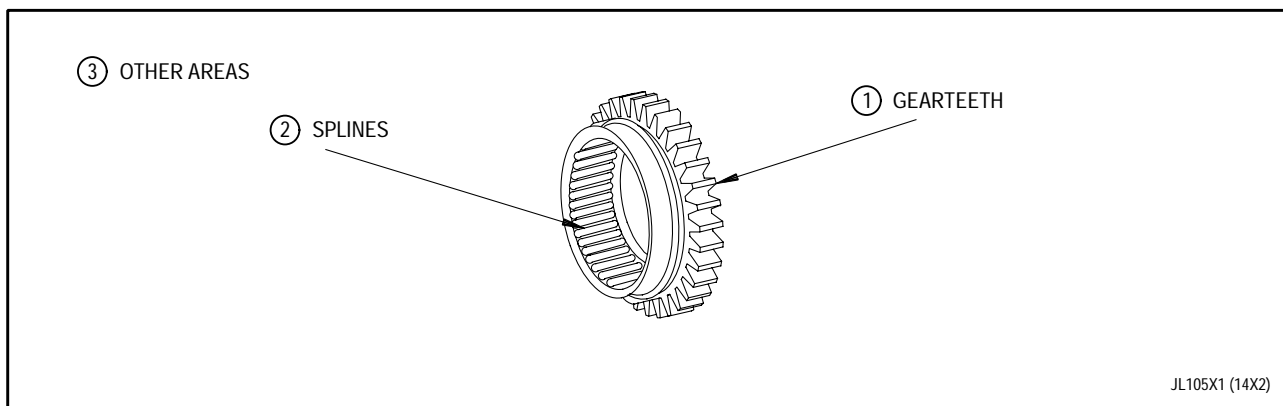
- a. This work package contains instructions for inspecting gearbox spur gear (gearbox drive spur bevel gearshaft).

**2. GEARBOX SPUR GEAR (GEARBOX DRIVE SPUR BEVEL GEARSHAFT) - INSPECTION.**

(See Figure 1.)

- a. Magnetic particle inspect.  
Refer to T.O. 2J-F100-9.

- b. Inspect gear. (See figure 1.)



**Figure 1. Gearbox Spur Gear (Gearbox Drive Spur Bevel Gearshaft) - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Gearteeth -			
Surface damage and high spots	None	0.002 inch depth	Blend. Refer to WP 419 00.
Pitting and spalling	0.010 inch depth provided pit is 0.025 inch from any tooth edge and longest dimension across pit does not exceed 0.020 inch.	See corrective action.	Blend. Refer to WP 419 00.
2. Splines -			
Wear (Check using surface plate, Vee blocks and standard incitor gage.)	External spline wear - 0.010 inch Internalspline wear - 0.005 inch	Not repairable	Replace spur gear.
3. Other areas -			
Nicks, dents, and scratches	Not serviceable	See corrective action.	Blend. Refer to WP 419 00.

# WORK PACKAGE

## TECHNICAL PROCEDURES

GEAR, SPUR, GEARBOX (GEARBOX IDLER GEARSHAFT) -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
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REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

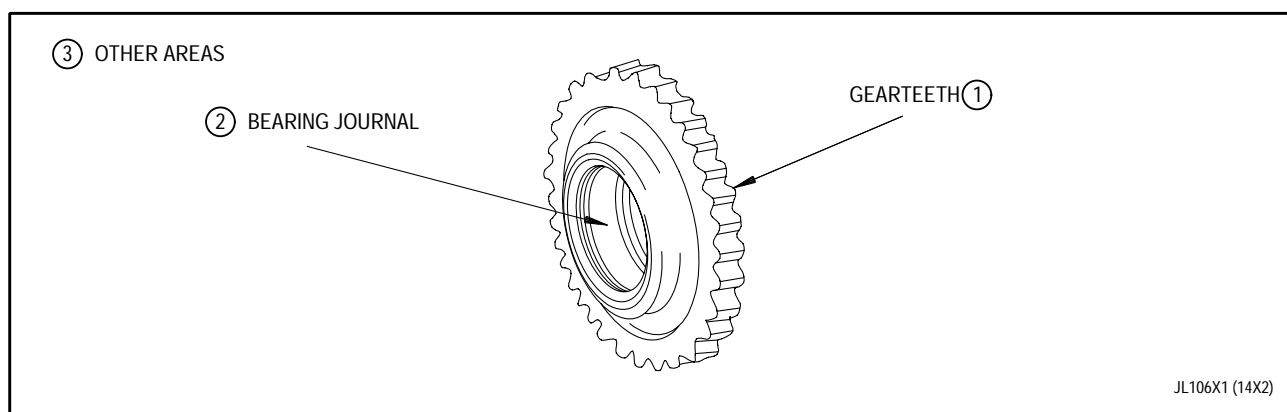
- a. This work package contains instructions for inspecting gearbox spur gear (gearbox idler gearshaft).

**2. GEARBOX SPUR GEAR (GEARBOX IDLER GEARSHAFT) - INSPECTION.**

(See Figure 1.)

- a. Magnetic particle inspect.  
Refer to T.O. 2J-F100-9. No cracks allowed.

- b. Inspect gear. (See figure 1.)



**Figure 1. Gearbox Spur Gear (Gearbox Idler Gearshaft) - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Gearteeth -			
Surface damage and high spots	None	0.002 inch depth	Blend. Refer to WP 420 00.
Pitting and spalling	0.010 inch depth provided pit is 0.025 inch from any tooth edge and longest dimension across pit does not exceed 0.020 inch.	See corrective action.	Blend. Refer to WP 420 00.
2. Bearing journal -			
Axial scratches	0.010 inch depth provided tolerances for proper assembly are not affected.	See corrective action.	Machine journals. Refer to WP 420 00.
Wear	Not serviceable	See corrective action.	Plate/machine journals. Refer to WP 420 00.
3. Other areas -			
Nicks, dents and scratches	Not serviceable	See corrective action.	Blend. Refer to WP 420 00.

# WORK PACKAGE

## TECHNICAL PROCEDURES

SPACER, (REDUCTION) GEARBOX BEARING, INNER AND OUTER -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

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3	.	.	.	1	.
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REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None



## 1. INTRODUCTION.

a. This work package contains instructions for inspecting gearbox bearing outer and inner spacers.

b. Inspect contact surfaces and holes for pickup, burrs or galling. Hand blend with fine abrasive stone to remove raised metal. (See figure 1.)

## 2. GEARBOX BEARING OUTER AND INNER SPACER.

(See Figure 1.)

a. Fluorescent penetrant inspect.  
Refer to T.O. 2J-F100-9.

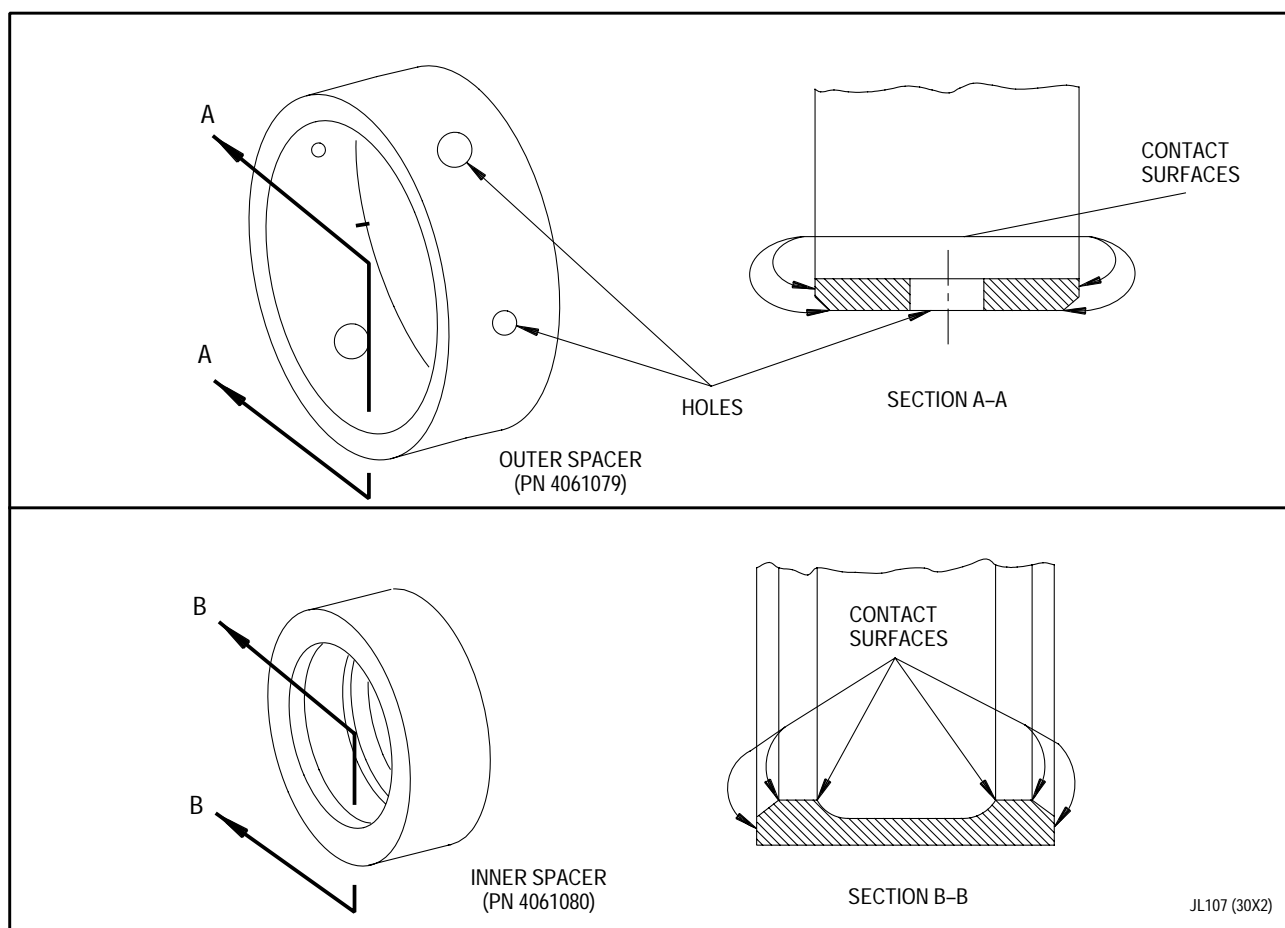


Figure 1. Gearbox Bearing Outer and Inner Spacer



# WORK PACKAGE

## TECHNICAL PROCEDURES

GEAR, SPUR, GEARBOX (DEAERATOR IMPELLER SHAFT) -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	.	.	.	.	1
2	-	3	.	.	0
4	.	.	.	.	1

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

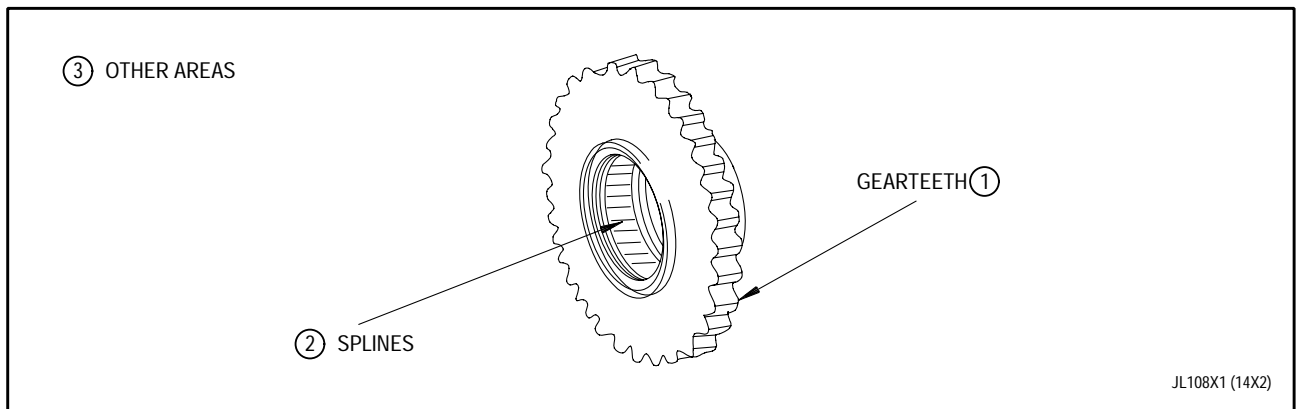
**1. INTRODUCTION.**

- a. This work package contains instructions for inspecting gearbox spur gear (deaerator impeller shaft).

**2. GEARBOX SPUR GEAR (DEAERATOR IMPELLER SHAFT) - INSPECTION.**

(See Figure 1.)

- a. Magnetic particle inspect.  
Refer to T.O. 2J-F100-9. No cracks allowed.
- b. Inspect gear. (See figure 1.)



**Figure 1. Gearbox Spur Gear (Deaerator Impeller Shaft) - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Gearteeth -			
Surface damage and high spots	None	0.002 inch depth	Blend repair per WP 422 00.
Pitting and spalling	0.010 inch depth provided pit is 0.025 inch from any tooth edge and longest dimension across pit does not exceed 0.020 inch.	See corrective action.	Blend repair per WP 422 00.
2. Splines -			
Wear (check using surface plate, Vee blocks and standard indicator gage)	External spline wear - 0.010 inch Internal spline wear - 0.005 inch	Not reparable	Replace spur gear.
Damage	Not serviceable	See corrective action.	Blend repair per WP 422 00.
3. Other areas -			
Nicks, dents, and scratches	Not serviceable	See corrective action.	Blend repair per WP 422 00.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### IMPELLER, GEARBOX DEAERATOR -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4					0

REFERENCE MATERIAL REQUIRED

Title	Number
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Table of Limits and Clearance Charts - - - - -	WP 801 00
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None



## 1. INTRODUCTION.

- a. This work package contains instructions for inspection of gearbox deaerator impeller.

## 2. GEARBOX DEAERATOR IMPELLER - INSPECTION.

(See Figure 1.)

- a. Fluorescent penetrant inspect impeller. Refer to T.O. 2J-F100-9. No cracks allowed.
- b. Inspect impeller. (See figure 1.)

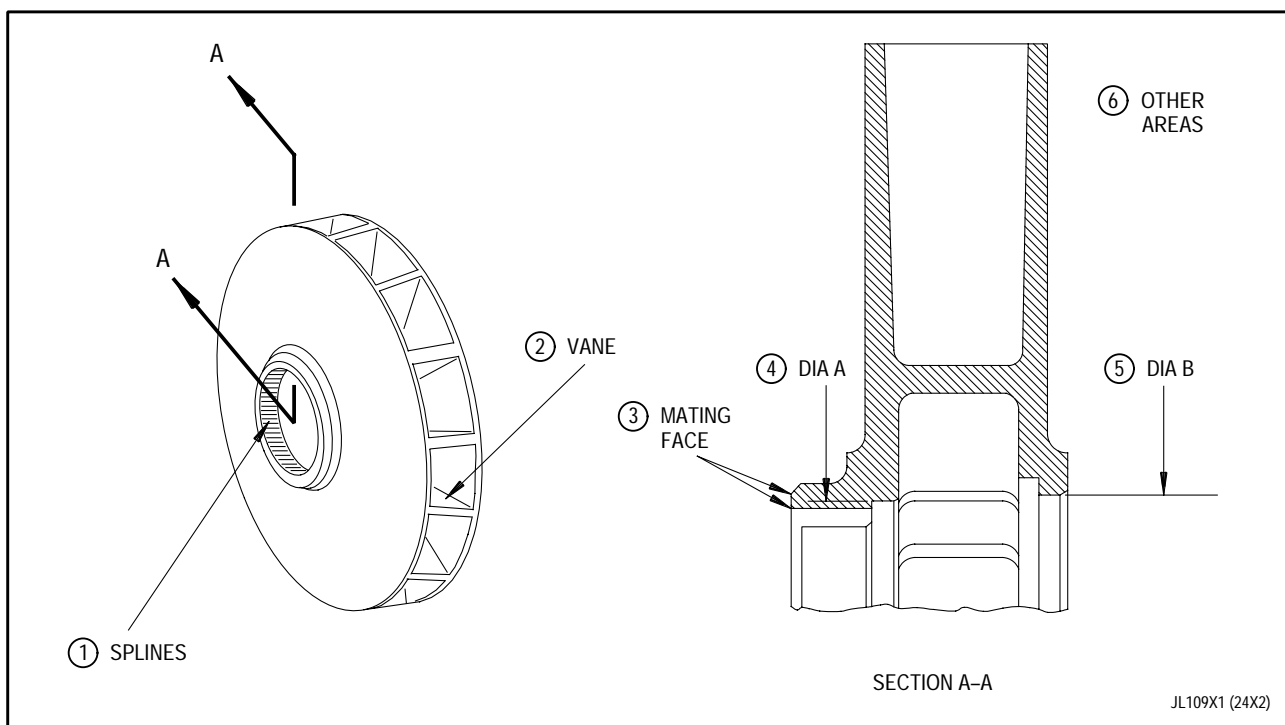


Figure 1. Gearbox Deaerator Impeller - Inspection

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Splines			
Wear (Check using surface plate, vee blocks and standard indicator gage)	Internal spline wear 0.005 inch. Refer to WP 801 00, Reference 5338.	Not reparable	Replace impeller.
2. Vane -			
Damage	Not serviceable	0.020 inch depth	Minor damage shall be carefully blended out by removing minimum amount of material.
3. Mating face -			
Fretting	-	See corrective action.	Repair. Refer to WP 423 00.
4. Diameter A -			
Wear	Refer to WP 801 00, Reference 5304.	Not reparable	Replace impeller.
5. Diameter B -			
Wear	Refer to WP 801 00, Reference 5303.	Not reparable	Replace impeller.
6. Other areas -			
Nicks, dents, and scratches	Not serviceable	0.020 inch depth	Minor damage shall be carefully blended out by removing minimum amount of material.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### COVER ASSEMBLY, GEARBOX UPPER -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	.	.	.	.	1
2	-	3	.	.	0
4	.	.	.	.	1

T.O. 2J-F100-53-11  
WP 324 00

REFERENCE MATERIAL REQUIRED

Title	Number
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Table of Limits and Clearance Charts - - - - -	WP 801 00
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

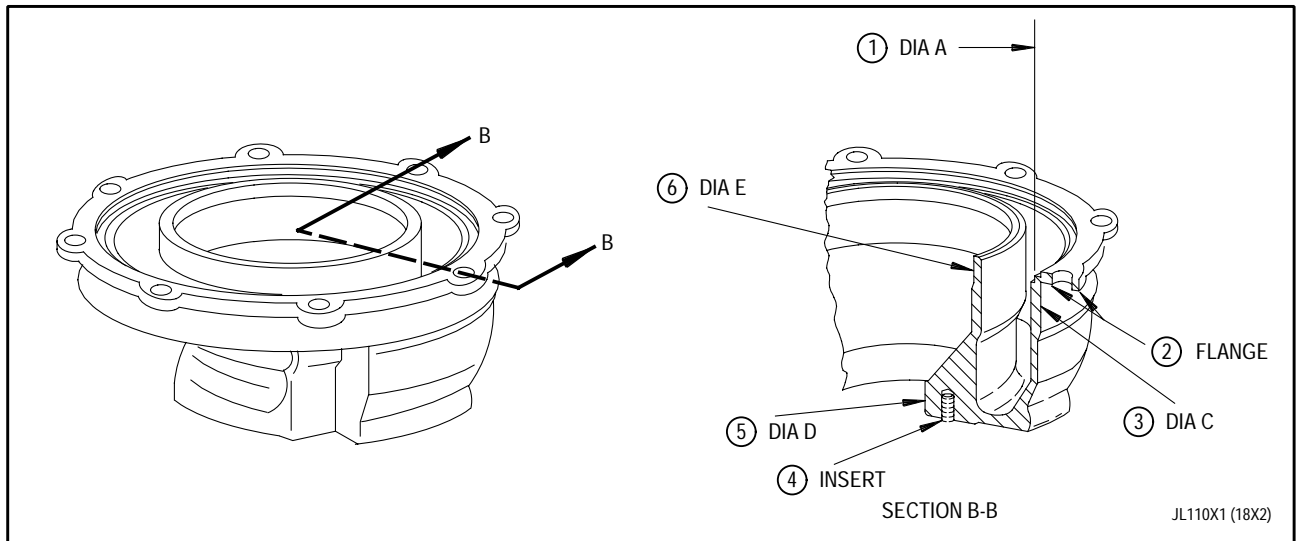
**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of gearbox upper cover assembly.

**2. GEARBOX UPPER COVER ASSEMBLY - INSPECTION.**

(See Figure 1.)

- a. Inspect cover assembly. (See figure 1.)
- b. Fluorescent penetrant inspect cover assembly. Refer to T.O. 2J-F100-9. No cracks allowed.



**Figure 1. Gearbox Upper Cover Assembly - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Diameter A - Wear	Refer to WP 801 00, Reference 5329.	See corrective action.	Machine/plate per WP 424 00.
2. Flange - Galling	Not serviceable	0.010 inch deep	Blend raised metal per WP 424 00.
3. Diameter C - Wear	Refer to WP 801 00, Reference 5328.	See corrective action.	Machine/plate per WP 424 00.
4. Insert - Broken, loose, or damaged	Not serviceable	Not reparable	Replace insert per WP 424 00.
5. Diameter D - Damage	Refer to WP 801 00, Reference 5324.	See corrective action.	Machine/plate per WP 424 00.
6. Diameter E - Wear	4.363 inch diameter maximum	See corrective action.	Machine/plate per WP 424 00.
Any Location - Nicks, dents, scratches	Not serviceable	0.010 inch deep	Blend repair raised metal per WP 424 00.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### SLEEVE, SEALING GEARBOX -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	.	.	.	.	1
2	.	.	.	.	0
3 - 4	.	.	.	.	1

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Table of Limits and Clearance Charts - - - - -	WP 801 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None



**1. INTRODUCTION.**

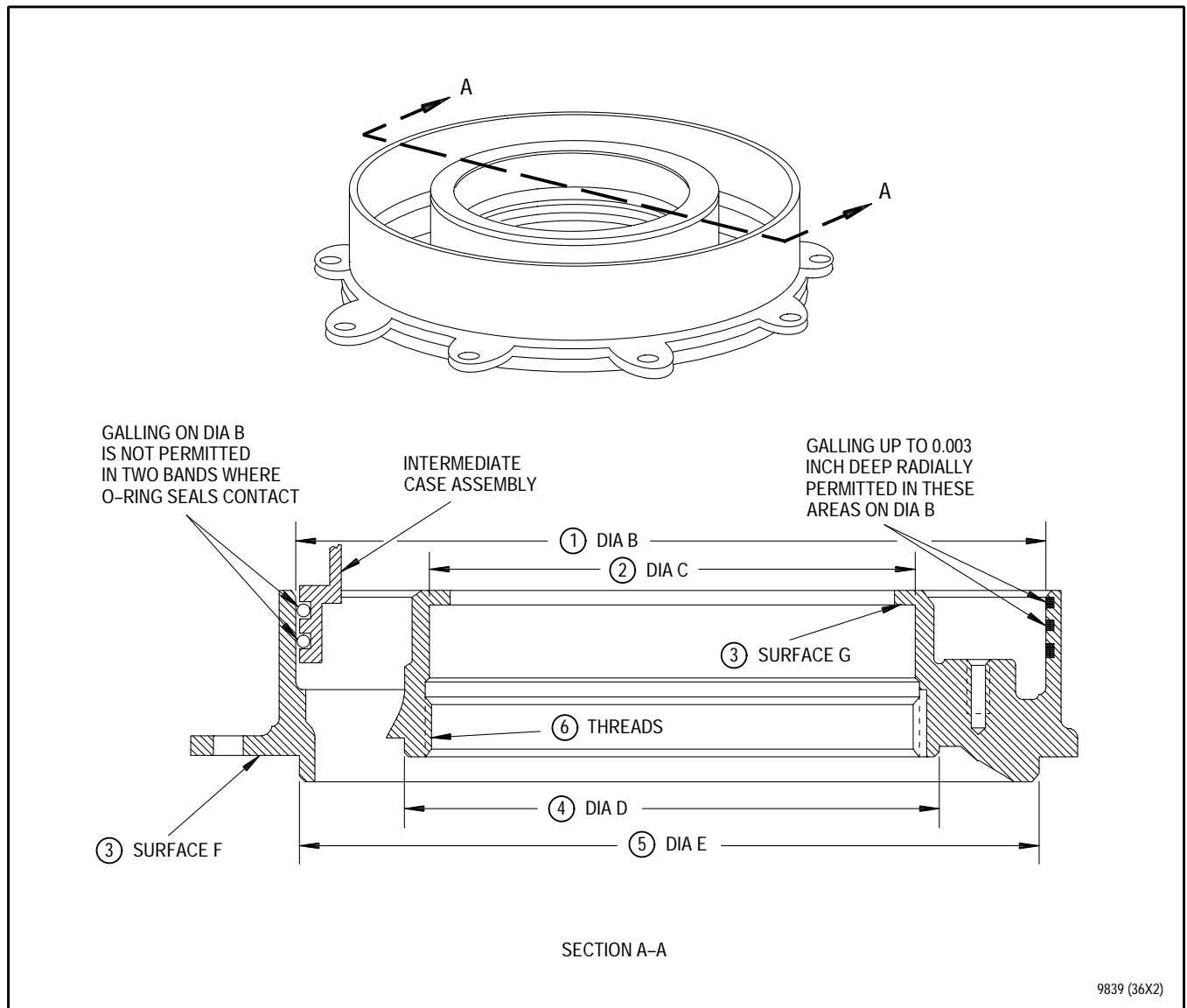
- a. This work package contains instructions for inspection of gearbox sealing sleeve.

**2. GEARBOX SEALING SLEEVE - INSPECTION.**

(See Figure 1.)

- a. Fluorescent penetrant inspect.  
Refer to T.O. 2J-F100-9.

- b. Inspect sleeve. (See figure 1.)



**Figure 1. Gearbox Sealing Sleeve - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1 Diameter B - Nicked, dented	Not serviceable	Not reparable	Replace sleeve.
Galling	0.003 inch deep	Not reparable	Replace sleeve.
2. Diameter C - Worn	Refer to WP 801 00, Reference 5326.	Not reparable	Replace sleeve.
3. Surfaces G and F - Nicked, scored	Not serviceable	Nor reparable	Replace sleeve.
4. Diameter D - Worn	4.348 inch diameter minimum	Not reparable	Replace sleeve.
5. Diameter E - Worn	Refer to WP 801 00, Reference 5329.	Not reparable	Replace sleeve.
6 Threads -	Not serviceable	All thread pickup and raised metal shall be removed.	Hand blend with fine abrasive stone to remove raised metal and thread pickup.
Any location - Nicked, dented, scratched	Not serviceable	See corrective action.	Hand blend with fine asbrasive stone to remove raised metal.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### COVER ASSEMBLY, GEARBOX SUMP -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 . . . . .		1			
2 . . . . .		0			
3 . . . . .		1			
4 Blank . . . . .		0			

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

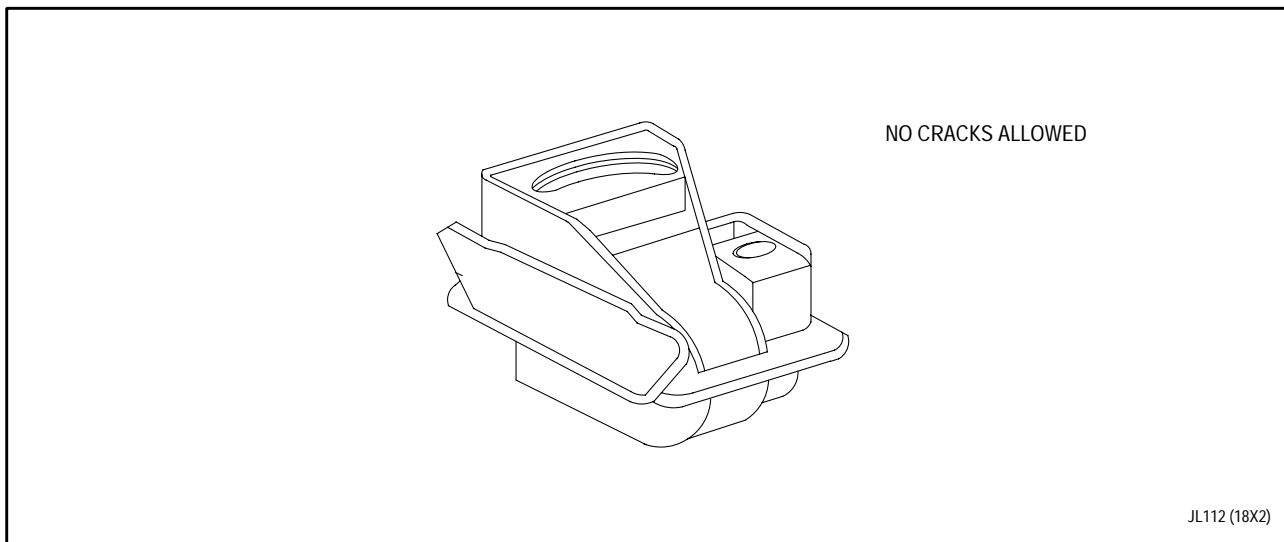
**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of gearbox sump cover assembly.

**2. GEARBOX SUMP COVER ASSEMBLY - INSPECTION.**

(See Figure 1.)

- a. Fluorescent penetrant inspect. Refer to T.O. 2J-F100-9.
- b. Inspect cover. (See figure 1.)
- c. Minor nicks and scratches are acceptable.



**Figure 1. Gearbox Sump Cover Assembly - Inspection**



# WORK PACKAGE

## TECHNICAL PROCEDURES

### PLATE ASSEMBLY, RETAINING, GEARBOX BEARING -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	.	.	.	.	5
2	.	.	.	.	0
3	.	.	.	.	5
4	Blank	.	.	.	0

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None



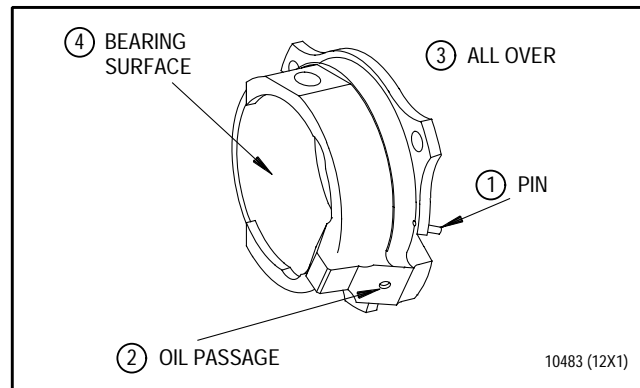
**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of gearbox bearing retaining plate assembly.

**2. GEARBOX BEARING RETAINING PLATE ASSEMBLY - INSPECTION.**

(See Figure 1.)

- a. Magnetic particle inspect.  
Refer to T.O. 2J-F100-9. No cracks allowed.
- b. Inspect retaining plate. (See figure 1.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Pin -			
Damage	Not serviceable	Not reparable	Replace pin per WP 407 00.
2. Oil passage -			
Blocked	Not serviceable	See corrective action.	Remove blockage per WP 407 00.
3. All over -			
Nicks, dents, and scratches	Not serviceable	0.010 inch deep	Remove raised metal per WP 407 00.
4. Bearing surface -			
Galling, raised metal	Not serviceable	Not reparable	Replace plate assembly.

**Figure 1. Gearbox Bearing Retaining Plate Assembly - Inspection**



# WORK PACKAGE

## TECHNICAL PROCEDURES

### PLATE, RETAINING, GEARBOX BEARING -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4					0

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

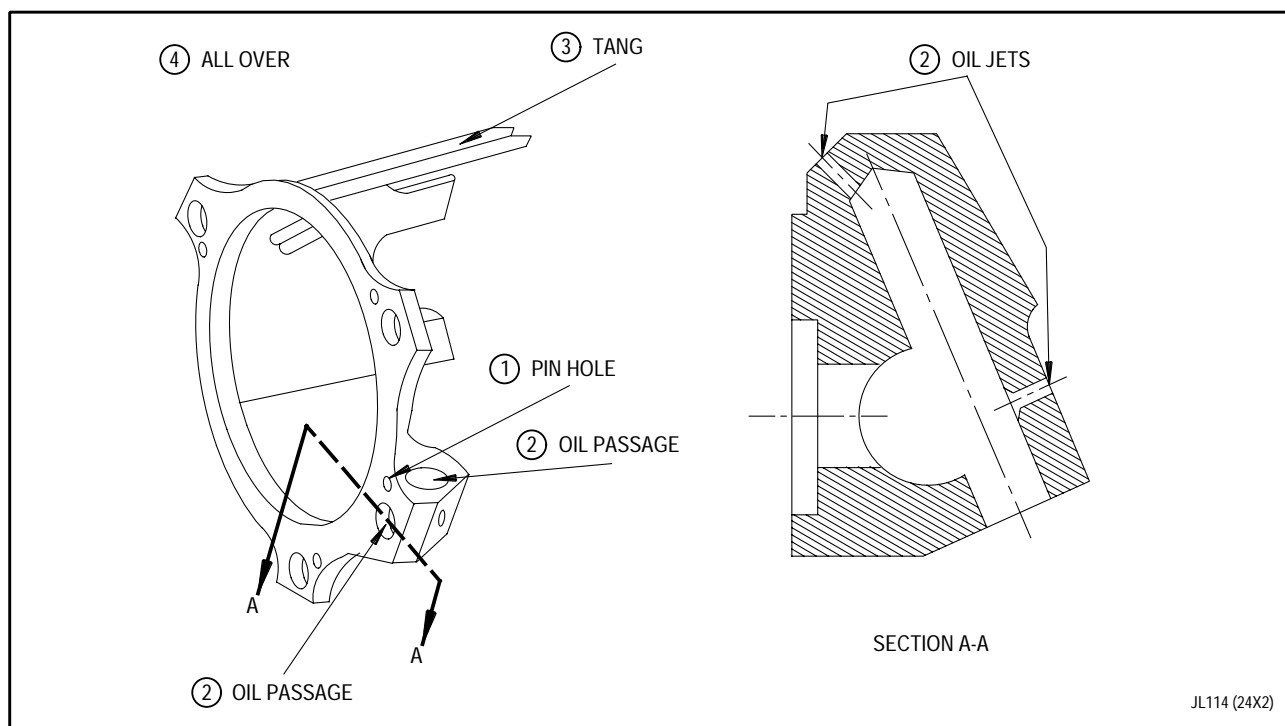
- a. This work package contains instructions for inspection of gearbox bearing retaining plate.

**2. GEARBOX BEARING RETAINING PLATE - INSPECTION.**

(See Figure 1.)

- a. Magnetic particle inspect.  
Refer to T.O. 2J-F100-9. No cracks allowed.

- b. Inspect plate. (See figure 1.)



**Figure 1. Gearbox Bearing Retaining Plate - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Pin hole -			
Damage	Not serviceable	Not repairable	Replace plate.
2. Oil passages and oil jets -			
Blocked	Not serviceable	See corrective action.	Remove blockage. Do not alter passages.
3. Tang -			
Bent	Not serviceable	Not repairable	Replace plate.
4. All over -			
Nicks, dents, and scratches	Not serviceable	0.010 inch deep	Remove high spots.

# WORK PACKAGE

## TECHNICAL PROCEDURES

TUBE, TRANSFER, GEARBOX BEARING -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4					0

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None



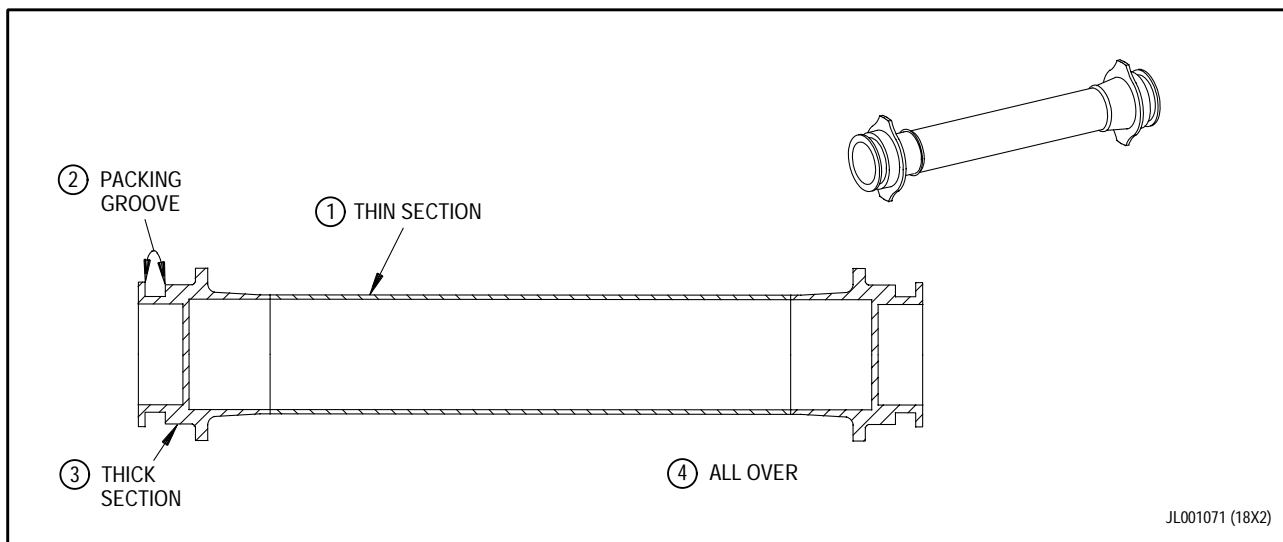
**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of the gearbox bearing transfer tube.

**2. GEARBOX BEARING TRANSFER TUBE - INSPECTION.**

(See Figure 1.)

- a. Inspect tube. (See figure 1.)



**Figure 1. Gearbox Bearing Transfer Tube - Inspection**

## Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Thin section -			
Nicks and scratches	0.010 inch deep	0.020 inch deep	Blend repair. Refer to WP 429 00.
2. Packing groove -			
Any damage	Not serviceable	0.005 inch deep	Blend repair. Refer to WP 429 00.
3. Thick sections -			
Nicks and scratches	0.020 inch deep	0.040 inch deep	Blend repair. Refer to WP 429 00.
4. All over -			
Scratches	Scratches extending 180 degrees or more are not serviceable	180 degrees	Blend repair. Refer to WP 429 00.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### BAFFLE ASSEMBLY AND HOUSING BAFFLE, GEARBOX -

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4					0

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-53-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

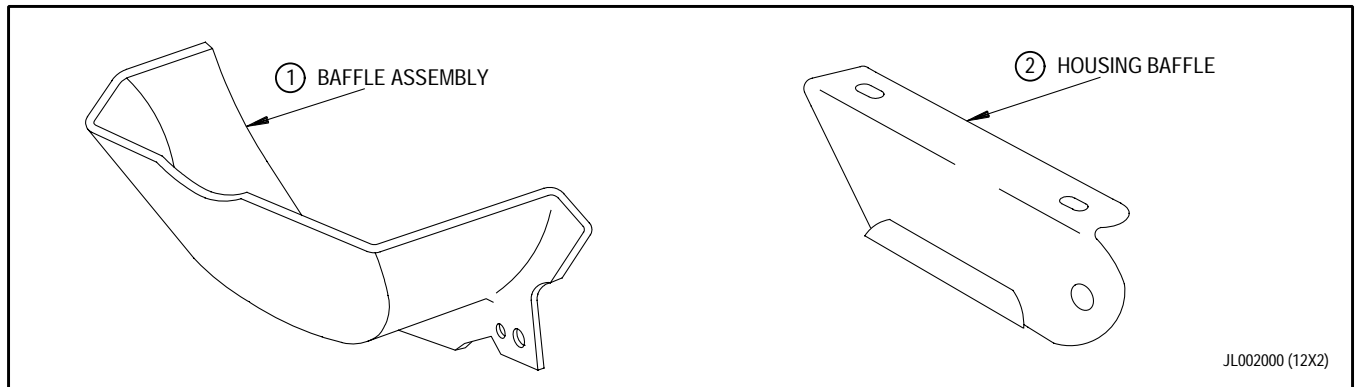
- a. This work package contains instructions for inspection of gearbox baffle assembly.

**2. GEARBOX BAFFLE ASSEMBLY AND HOUSING BAFFLE - INSPECTION.**

(See Figure 1.)

- a. Fluorescent penetrant inspect.  
Refer to T.O. 2J-F100-9.

- b. Inspect baffle. (See figure 1.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Baffle assembly -			
Cracks	Not serviceable	Not repairable	Replace baffle.
Scratches and nicks	0.005 inch deep	0.015 inch deep	Blend. Refer to WP 430 00.
Dents	0.050 inch deep	Not repairable	Replace baffle.
Galling	Not serviceable	0.005 inch deep	Polish. Refer to WP 430 00.

**Figure 1. Gearbox Baffle Assembly and Housing Baffle**

## Legend to Figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
2. Housing Baffle -			
Cracks	Not serviceable	Not reparable	Replace baffle.
Scratches and nicks	0.005 inch deep	0.015 inch deep	Blend. Refer to WP 430 00.
Dents	0.050 inch deep	Not reparable	Replace baffle.
Galling	Not serviceable	0.005 inch deep	Polish. Refer to WP 430 00.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### VALVE ASSEMBLY, BREATHER PRESSURIZING -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4					0

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None



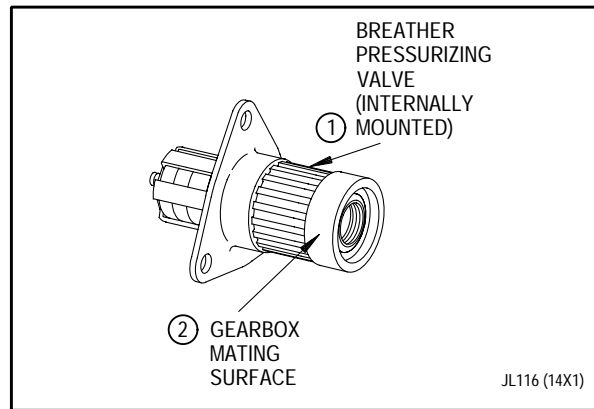
**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of breather pressurizing valve assembly.

**2. BREATHER PRESSURIZING VALVE ASSEMBLY - INSPECTION.**

(See Figure 1.)

- a. Inspect breather pressurizing valve assembly. (See figure 1.)



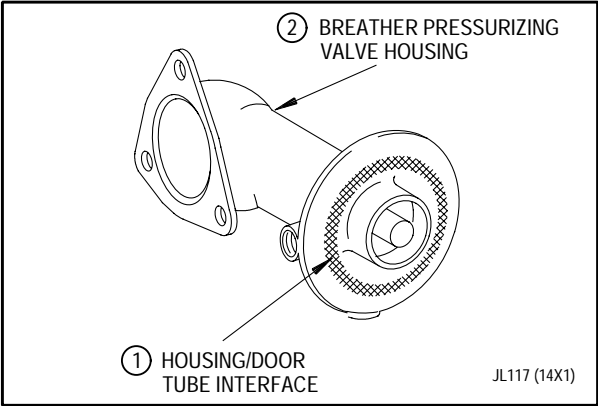
Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Breather pressurizing valve (internally mounted) -			
Loss of spring compression	Not serviceable	See corrective action.	Replace valve.
2. Gearbox mating surface -			
Scratches, chips and cracks	Not serviceable	See corrective action.	Replace valve.

**Figure 1. Breather Pressurizing Valve Assembly - Inspection**

3. BREATHER PRESSURIZING VALVE  
HOUSING - INSPECTION.

(See Figure 2.)

- a. Inspect breather pressurizing  
valve housing. (See figure 2.)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Housing/door tube interface -  Wear rings or patterns	Not to exceed 0.035 inch deep with a total wear width in any one area not to exceed 0.400 inch.	See corrective action.	Replace housing.
2. Breather pressurizing valve housing -  Cracks	Not serviceable	See corrective action.	Replace housing.

Figure 2. Breather Pressurizing Valve Housing - Inspection

# WORK PACKAGE

## TECHNICAL PROCEDURES

### COUPLING, REMOTE GEARBOX DRIVESHAFT -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 . . . . .	23	3 - 4 . . . . .	23	5 Added . . . . .	23
2 . . . . .	0			6 Blank Added . . . . .	23

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

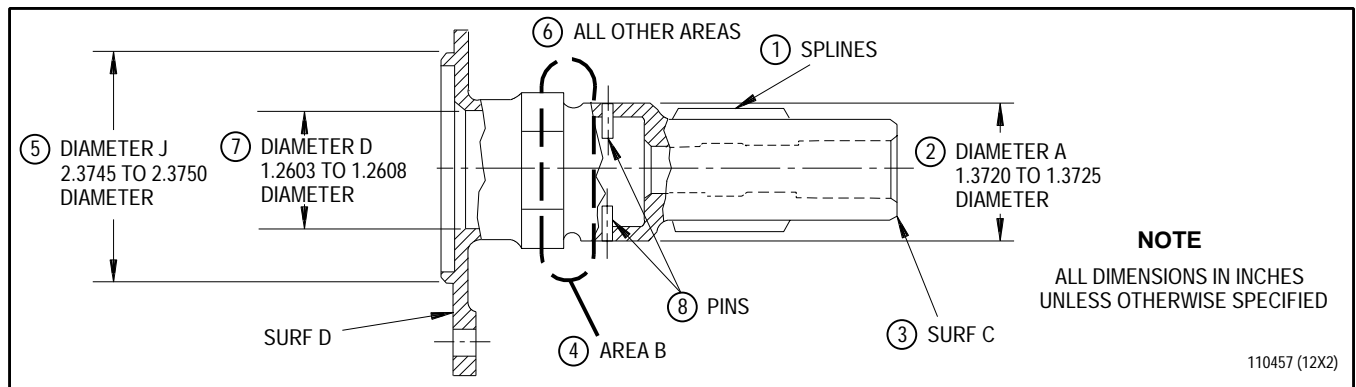
**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of remote gearbox driveshaft coupling.

**2. REMOTE GEARBOX DRIVESHAFT COUPLING - INSPECTION.**

(See Figures 1. and 2.)

- a. Nondestructive inspect. Refer to T.O. 2J-F100-9.
- b. Visually inspect coupling. (See figure 1.)

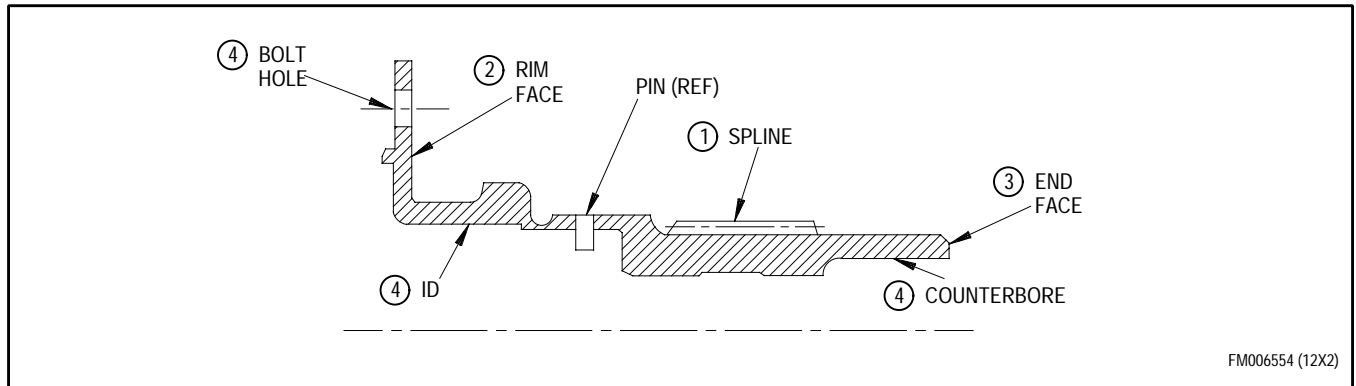


Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Splines -			
Pits, dents, and nicks	Not serviceable	0.007 inch depth after removal of raised metal	Blend repair per WP 432 00.
2. Diameter A -			
Pitting	Widely scattered surface pitting is acceptable.	See corrective action.	Blend repair per WP 432 00.
Surface roughness	0.005 inch deep	0.010 inch deep	Repair surfaces. Refer to WP 432 00.
Wear	1.3720 inch diameter minimum in wear area	0.010 inch deep	Nickel plate. Refer to WP 432 00.
3. Surface C -			
Squareness	Square with Dia. A within 0.0005 inch total.	4.449 inches minimum from Surface C to Surface D.	Square face. Refer to WP 432 00.

**Figure 1. Remote Gearbox Driveshaft Coupling - Inspection**

## Legend to figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
4. Area B -			
Cracks in mid-shear section	Not serviceable	See corrective action.	Replace coupling.
5. Diameter J -			
Pitting	Widely scattered surface pitting is acceptable.	See corrective action.	Blend repair. Refer to WP 432 00.
Surface roughness	0.005 inch deep	0.010 inch deep	Repair surfaces. Refer to WP 432 00.
Wear	2.3745 inch minimum diameter	0.010 inch deep	Nickel Plate. Refer to WP 432 00.
Concentricity	Concentric with Diameter A within 0.0005 inch FIR	See corrective action.	Repair. Refer to WP 432 00.
6. All other areas -			
Nicks, scratches, gouges and corrosion	Not serviceable	0.008 inch depth	Repair. Refer to WP 432 00.
7. Diameter D -			
Pitting	Widely scattered surface pitting is acceptable	See corrective action.	Blend repair per WP 432 00.
Surface roughness	0.005 inch deep	0.010 inch deep	Repair surfaces per WP 432 00.
Wear	1.2608 inch maximum diameter in wear area	0.010 inch deep	Nickel plate per WP 432 00.
Concentricity	Concentric with diameter A within 0.0005 inch FIR	See corrective action.	Repair per WP 432 00.
8. Pins -			
Missing, bent	Not serviceable	See corrective action.	Replace pin(s).



FM006554 (12X2)

**NOTE**

- All dimensions in inches.
- Parts that exceed limits of figure legend shall be replaced.
- Areas identified on figure with same numbers will be considered separate areas when counting indications.

Inclusions Subsurface & Surface		Surface Inclusions	
Area No.	Conditions & Limits	Max. No. Per Area	Max. Length Each
<u>All</u>	Inclusions must be separated by 0.125 or more.  Unless otherwise specified, indications that extend over or into shoulder, edge, chamfer corner, radius, fillet, or hole regardless of function are not acceptable.  An inclusion is a discontinuity caused by entrapped foreign material. Use white light to verify discontinuity is an inclusion.	- - -	- - -
<u>1</u>	Surface inclusions must be well centered on spline lands or grooves. Total combined length of surface inclusions in same axial plane shall not exceed maximum length allowed for one discontinuity.	3	1 2 0.125 0.062
<u>2</u>	Total combined length of surface inclusions in same axial plane shall not exceed maximum length allowed for one discontinuity.	6	1 2 4 0.312 0.187 0.062
<u>3</u>	Pinpoint discontinuity.	5	5 Diameter less than 0.015
<u>4</u>	Surface inclusions shall not exceed 1/4 of area length. Surface must show light particle pattern indicative of shallow inclusions.  Total combined length of surface inclusions in same axial plane shall not exceed maximum length allowed for one discontinuity.	6 per 6 inches of length	1 2 4 0.312 0.187 0.062

**Figure 2. Remote Gearbox Driveshaft Coupling - MPI Serviceable Limits**





# WORK PACKAGE

## TECHNICAL PROCEDURES

### NOZZLE, GEARBOX BEARING (REDUCTION GEARBOX)

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3 . . . . .	0				
4 Blank . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

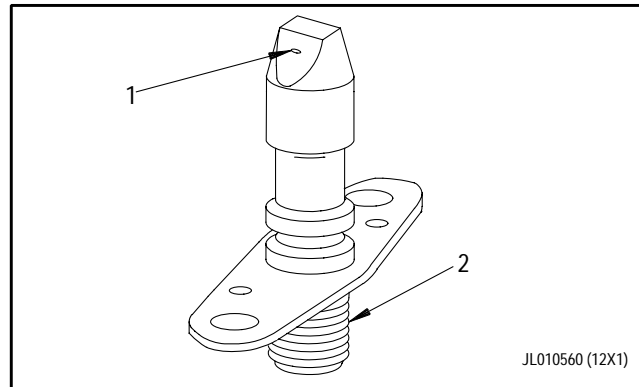
None

**1. INTRODUCTION.**

- a. This work package contains instructions for inspection of gearbox bearing nozzle (reduction gearbox).

**2. GEARBOX BEARING NOZZLE (REDUCTION GEARBOX - INSPECTION).**  
**(See Figure 1.)**

- a. Inspect nozzle per figure 1.  
 b. Flow test not required.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Oil holes - Blocked	Not serviceable	Any amount	Replace nozzle.
2. Threads - High metal, nicks, dents	Not serviceable	All thread pick up and high metal. Excessive damage first thread only	Replace nozzle.

**Figure 1. Gearbox Bearing Nozzle (Reduction Gearbox) - Inspection**



# WORK PACKAGE

## TECHNICAL PROCEDURES

### FITTINGS & ADAPTERS, GEARBOX -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3 . . . . .	0				
4 Blank . . . . .	0				

**T.O. 2J-F100-53-11**

**WP 334 00**

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

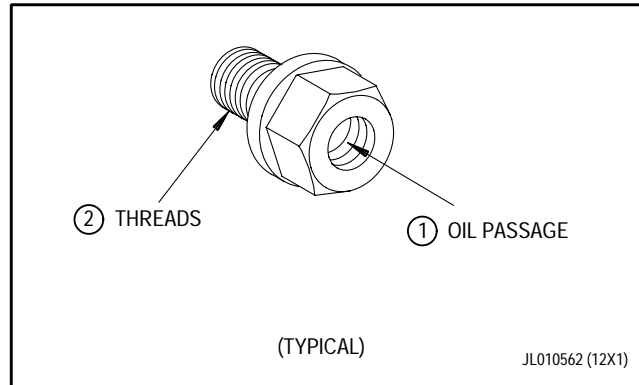
**1. INTRODUCTION**

- a. This work package contains instructions for inspection of gearbox fittings and adapters.

**2. FITTINGS & ADAPTERS - INSPECTION.**

(See Figure 1.)

- a. Visually inspect per figure 1.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Oil passages - Blocked	Not serviceable	Not repairable	Replace fitting or adapter.
2. Threads - High metal, nicks, dents	Not serviceable	Not repairable	Replace fitting or adapter.

**Figure 1. Fitting & Adapters - Inspection**





# WORK PACKAGE

## TECHNICAL PROCEDURES

### HOUSING, GEARBOX BEARING -

### INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	.	.	.	.	4
2	.	.	.	.	0
3	.	.	.	.	4
4	Blank	.	.	.	0

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

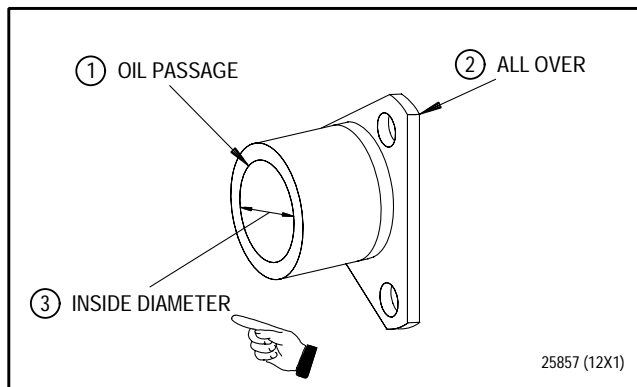
**1. INTRODUCTION**

- a. This work package contains instructions for inspection of gearbox bearing housing.

**2. GEARBOX BEARING HOUSING - INSPECTION**

(See Figure 1.)

- a. Fluorescent penetrant inspect per T.O. 2J-F100-9.
- b. Visually inspect per figure 1.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Oil passages - Blockage.	Not serviceable.	See corrective action.	Remove Blockage with compressed air.
2. All over - Nicks, dents and scratches.	Not serviceable.	See corrective action.	Remove raised material.
3. Inside diameter - Wear.	Not serviceable.	See corrective action.	Measure clearance, Refer to T.O. 2J-F100-53-11, WP 801, ref 5321.

**Figure 1. Gearbox Bearing Housing (Typical PN 4057335) - Inspection**



**WORK PACKAGE****TECHNICAL PROCEDURES****TUBE, SCAVENGE, GEARBOX -****INSPECTION****EFFECTIVITY: ENGINE MODELS F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 4

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 3 . . . . .					
4 Blank . . . . .					

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

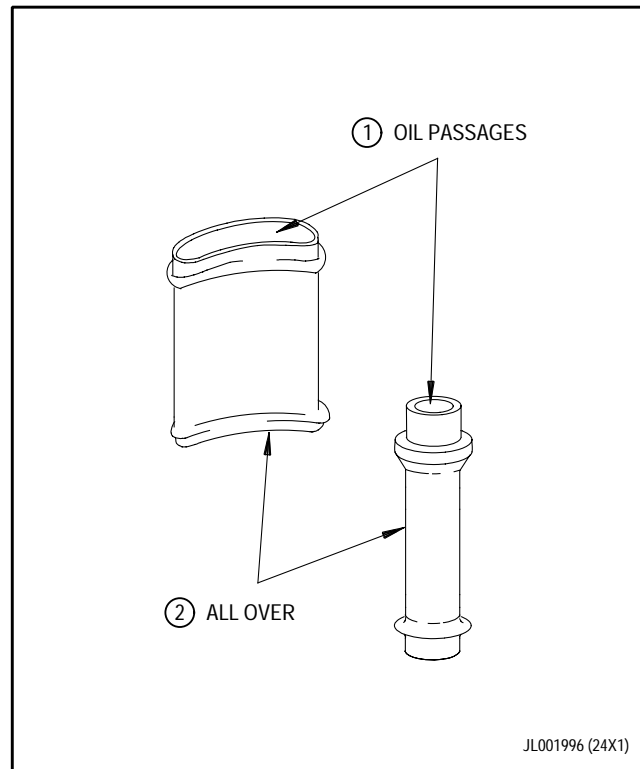
**1. INTRODUCTION**

- a. This work package contains instructions for inspection of gearbox scavenge tubes.

**2. GEARBOX SCAVENGE TUBES - INSPECTION**

(See Figure 1.)

- a. Fluorescent penetrant inspect per T.O. 2J-F100-9.
- b. Visually inspect per figure 1.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Oil passages - Blocked	Not serviceable	Not repairable	Replace scavenge tube.
2. All over - Nicks, dents and scratches	Not serviceable	Not repairable	Replace scavenge tube.

**Figure 1. Gearbox Scavenge Tubes - Inspection**





# WORK PACKAGE

## TECHNICAL PROCEDURES

## NOZZLE, GEARBOX, BEARING

## INSPECTION

EFFECTIVITY: ENGINE MODELS F100-PW-229

### LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3 . . . . .	0				
4 Blank . . . . .	0				

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

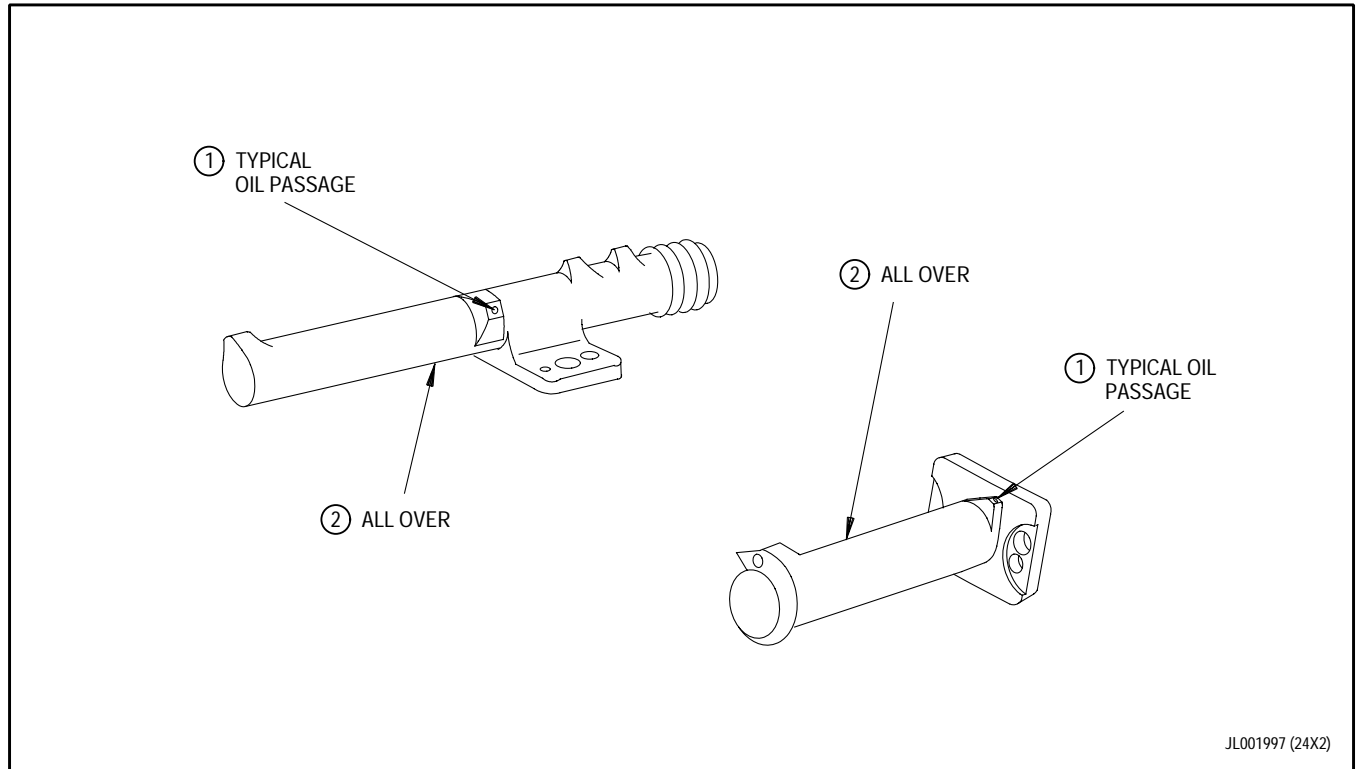
**1. INTRODUCTION**

- a. This work package contains instructions for inspection of gearbox bearing nozzle.

**2. GEARBOX NOZZLE BEARING - INSPECTION**

(See Figure 1.)

- a. Visually inspect per figure 1.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Oil passages - Blocked	Not serviceable	See corrective action	Remove blockage with compressed air (10 psi).
2. All over - Nicks, dents and scratches	Not serviceable	Not repairable	Replace bearing nozzle.

**Figure 1. Gearbox Bearing Nozzle - Inspection**



**WORK PACKAGE****TECHNICAL PROCEDURES****OIL NOZZLES AND TRANSFER TUBE, GEARBOX -****INSPECTION****EFFECTIVITY: ENGINE MODELS F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 4

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 3 . . . . .					
4 Blank . . . . .					

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

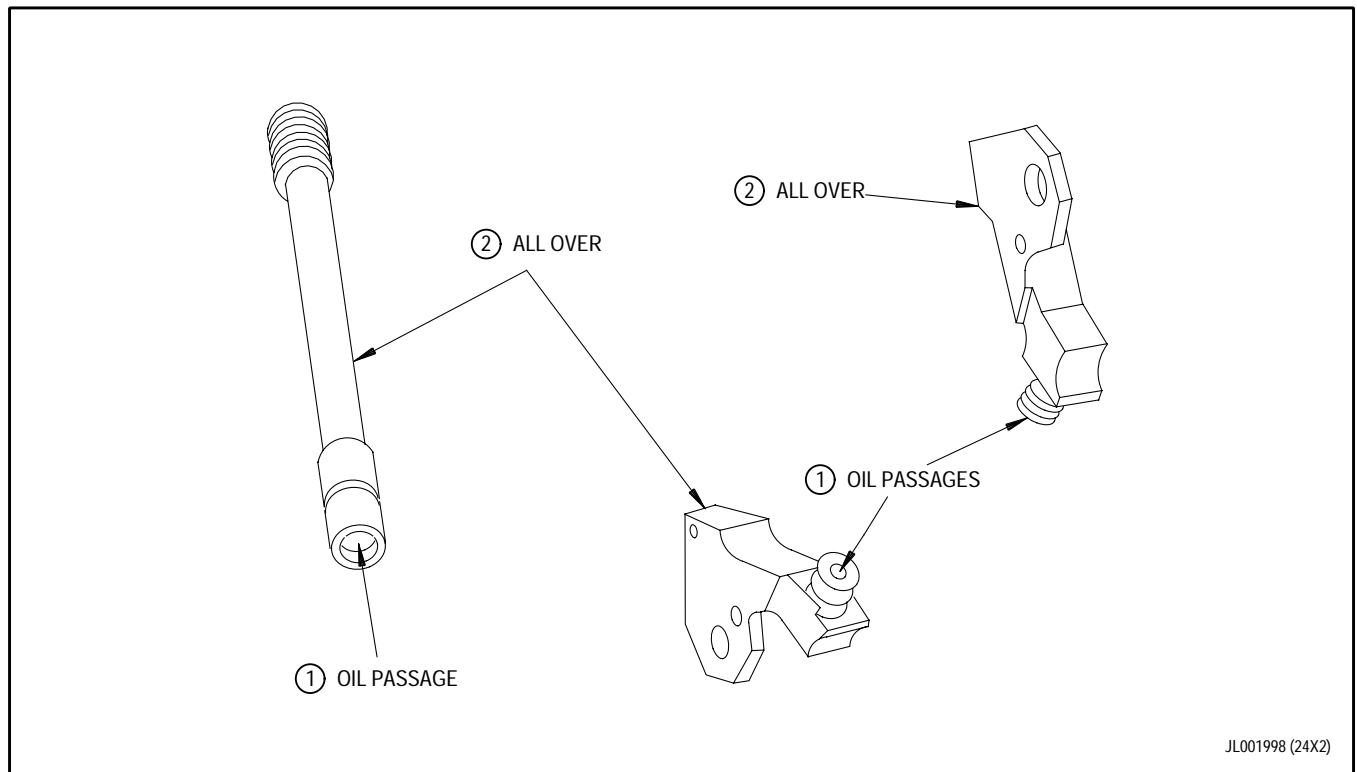
**1. INTRODUCTION**

- a. This work package contains instructions for inspection of gearbox oil nozzles and transfer tube.

**2. GEARBOX OIL NOZZLES AND TRANSFER TUBE - INSPECTION**

(See Figure 1.)

- a. Visually inspect per figure 1.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. Oil passages - Blocked	Not serviceable	See corrective action	Remove blockage with compressed air (10 psi).
2. All over - Nicks, dents and scratches	Not serviceable	Not repairable	Replace oil nozzles or transfer tubes.

**Figure 1. Gearbox Oil Nozzles and Transfer Tube - Inspection**





# WORK PACKAGE

## TECHNICAL PROCEDURES

### RETAINER, (REDUCTION) GEARBOX, OIL SEAL

## INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	.	.	.	.	1
2	.	.	.	.	0
3	.	.	.	.	1
4 Blank	.	.	.	.	0

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

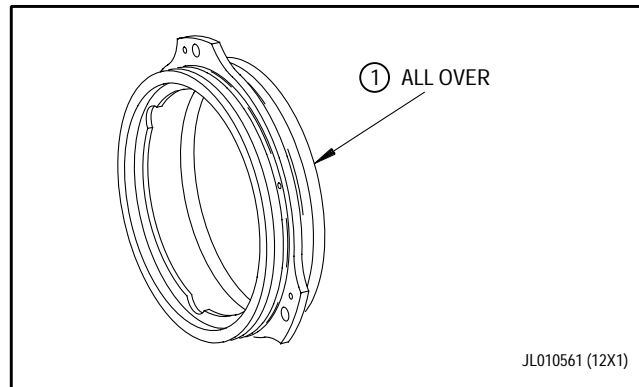
**1. INTRODUCTION**

- a. This work package contains instructions for inspection of reduction gearbox oil seal retainer.

**2. GEARBOX (REDUCTION) OIL SEAL RETAINER - INSPECTION**

(See Figure 1.)

- a. Fluorescent penetrant inspect per T.O. 2J-F100-9.
- b. Visually inspect per figure 1.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
1. All over -  Nicked, dented, scratched	Not serviceable	Not repairable	Hand blend with fine abrasive stone to remove raised metal.

**Figure 1. Reduction Gearbox Oil Seal Retainer - Inspection**



# WORK PACKAGE

## TECHNICAL PROCEDURES

### SCREEN PROTECTIVE, GEARBOX SUMP COVER -

## INSPECTION

EFFECTIVITY: ENGINE MODELS F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3 . . . . .	0				
4 Blank . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

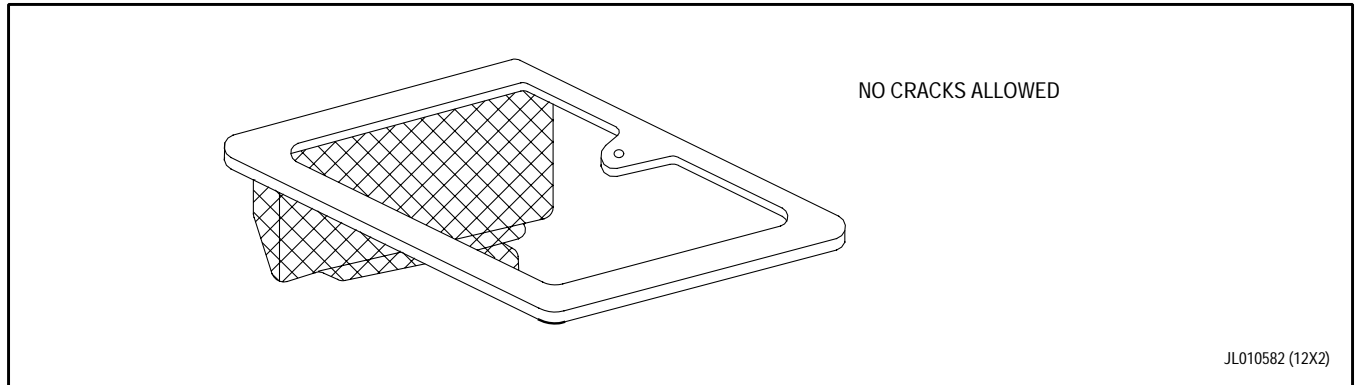
## 1. INTRODUCTION

- a. This work package contains instructions for inspection of the gearbox sump screen assembly.

## 2. GEARBOX SCAVENGE TUBES - INSPECTION

(See Figure 1.)

- a. Fluorescent penetrant inspect per T.O. 2J-F100-9.
- b. Visually inspect per figure 1.



**Figure 1. Gearbox Sump Screen Assembly - Inspection**





**WORK PACKAGE****INTRODUCTION****GEARBOX MODULE PARTS - REPAIR****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 4

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 2 . . . . .		1			
3 . . . . .		0			
4 Blank . . . . .		0			

**1. INTRODUCTION.**

- a. This work package introduces the 400 00 through 599 00 series of work packages for the gearbox module parts repair. The following work packages are included in this series.

<b>WP No.</b>	<b>Title</b>
401 00	Tubes, Gearbox External - Repair
402 00	Housing Assembly, Gearbox (Rear) - Repair
403 00	Cover, Packing, Gearbox - Repair
404 00	Seal Assembly, Face - Repair
405 00	Open
406 00	Retainer, Oil Seal, Gearbox - Repair
407 00	Plate Assembly, Retaining, Gearbox Bearing - Repair
408 00	Baffle, Gearbox - Repair
409 00	Seal Seat, (Reduction) Gearbox Bearing - Repair
410 00	Nozzle, Gearbox Bearing (Reduction Gearbox) - Repair
411 00	Open
412 00	Housing Assembly, Gearbox (Front) - Repair
413 00	Gearshaft, Spur, Gearbox - Repair
414 00	Gearshaft, Bevel, Spur, Gearbox Drive - Repair
415 00	Gear, Internal, Main Fuel Pump Drive - Repair
416 00	Shaft, Gearbox Idler Gear - Repair
417 00	Shaft, Gearbox Deaerator Impeller - Repair
418 00	Gearshaft, Bevel, Gearbox - Repair
419 00	Gear, Spur, Gearbox (Gearbox Drive Spur Bevel Gearshaft) - Repair
420 00	Gear, Spur, Gearbox (Gearbox Idler Gearshaft) - Repair

WP No.	Title
421 00	Open
422 00	Gear, Spur, Gearbox (Deaerator Impeller Shaft) - Repair
423 00	Impeller, Gearbox Deaerator - Repair
424 00	Cover Assembly, Gearbox Upper - Repair
425 00	Open
through	
428 00	
429 00	Tube, Transfer, Gearbox Bearing - Repair
430 00	Baffle Assembly, Gearbox - Repair
431 00	Open
432 00	Coupling, Remote Gearbox Driveshaft - Repair
433 00	Open
through	
599 00	



**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**TUBES, GEARBOX EXTERNAL -**

**REPAIR**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 14

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 . . . . .	3	13 . . . . .	3		
2 - 12 . . . . .	0	14 Blank . . . . .	0		

**T.O. 2J-F100-53-11**

**WP 401 00**

**REFERENCE MATERIAL REQUIRED**

<b>Title</b>	<b>Number</b>
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Brazing, Vacuum Furnace - - - - -	SWP 094 03
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Tubes Gearbox External - Inspection - - - - -	WP 301 00

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

<b>Nomenclature</b>	<b>Specification/Vendor Part Number</b>
Compound, carbide lapping	PMC 3014, 240 grain size
Cloth, crocus	P-C-458
Rod, rubberized abrasive	CRATEX, Grit No. 86XF
Stick, abrasive silicon carbide	Norton 37C400HV
Wheel, hemp	Norton Co.

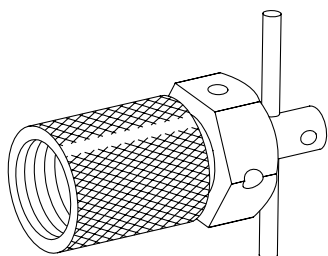
**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

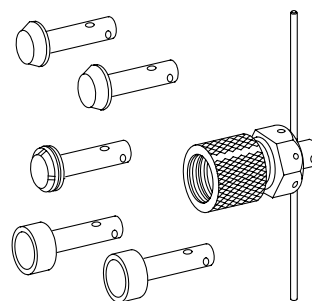
<b>Paragraph</b>	<b>Function - Tool Nomenclature</b>	<b>Tool Number</b>
4	Tube - Conical seat repair	
	Lap, Conical fitting - - - - -	PWA 51429
	Lap, Conical fitting - - - - -	PWA 52336

ILLUSTRATED SUPPORT EQUIPMENT



PWA 51429 -C

**Figure T1. PWA 51429 Lap**



PWA 52336 -C

**Figure T2. PWA 52336 Lap**

**1. INTRODUCTION.**

- a. This work package contains instructions for repair of packing transfer tube, the main oil pump scavenge tube assembly, and the oil tank scavenge tube connector.

(2) Polish blend using hemp wheel.

- b. Steel and nickel tubes.

**NOTE**

Blending must provide minimum radius of 0.060 inch. Depth of blend must not exceed 0.008 inch measured from smooth area of tube adjacent to blend area.

**2. TUBING - BLEND REPAIR.**

(See Table 1.)

**NOTE**

Blending of sharp edges, scratches, nicks, gouges, and pitting shall be done by hand. Power grinding is prohibited.

(1) Blend using hard abrasive stick or crocus cloth.

(2) Polish blend using hemp wheel.

- a. Titanium tubes. (See table 1.)

**NOTE**

Blending shall provide minimum radius of 0.060 inch. Depth of blend shall not exceed 0.006 inch measured from smooth area of tube adjacent to blend repair.

- c. Following rework, inspect tube. Refer to WP 301 00, including pressure check. Use 8X magnifying glass for visual inspection.

(1) Hand blend using rubberized abrasive rod.

**Table 1. Gearbox Module External Tubing - Material and Diameter**

Part Number	Nomenclature	Material	OD (Inch)	Wall Thickness (Inch)
4017861	Packing transfer tube (oil filter to main oil pump)	Titanium alloy	1.000	0.028
4045639-01	Main oil pump scavenge tube assembly - tube	Titanium alloy	0.7525	0.028
4044147	Oil tank scavenge tube connector - tube	AMS 5646 stainless steel	0.775	0.038



**3. TUBE COUPLING NUT LOCKWIRE HOLE - REPAIR.**

- a. Drill 0.65 to 0.75 inch diameter hole (for tubes larger than 1/4 inch) on adjacent hex corners of nut.

**NOTE**

Hole shall not break through inner portion of nut.

- b. Deburr hole.

**4. TUBE CONICAL SEAT - REPAIR.**

(See Figures 1 and 2, and table 1 and Table 2.)

- a. Repair male conical seat as follows:

- (1) Select appropriate facing tool (See tables 1 and 2.), and assemble. (See figure 1.)

**NOTE**

Operator shall wear clean, lint-free gloves when handling reworked fittings. This is required to prevent acid-staining highly finished conical seat surface.

- (2) Rotate cutter to shave off minimum amount of material necessary to remove damage and to obtain required cone.
- (3) Machine Surface Y, figure 1, to obtain required dimensions. Axis of conical surface must be concentric with respective thread pitch diameter within 0.005 inch FIR.

**Table 2. Lap Tool - Dimensional Ranges**

Lap Tool No.	Nominal Tube OD (Inch)	Thread Size
PWA 52336	0.750	1.0625-12
PWA 51429	0.875	1.1875-12

**T.O. 2J-F100-53-11**

**WP 401 00**

(4) Inspect conical seat. Refer to WP 301 00. If seat is acceptable, omit step a.(5).

(5) Lap seat as follows:

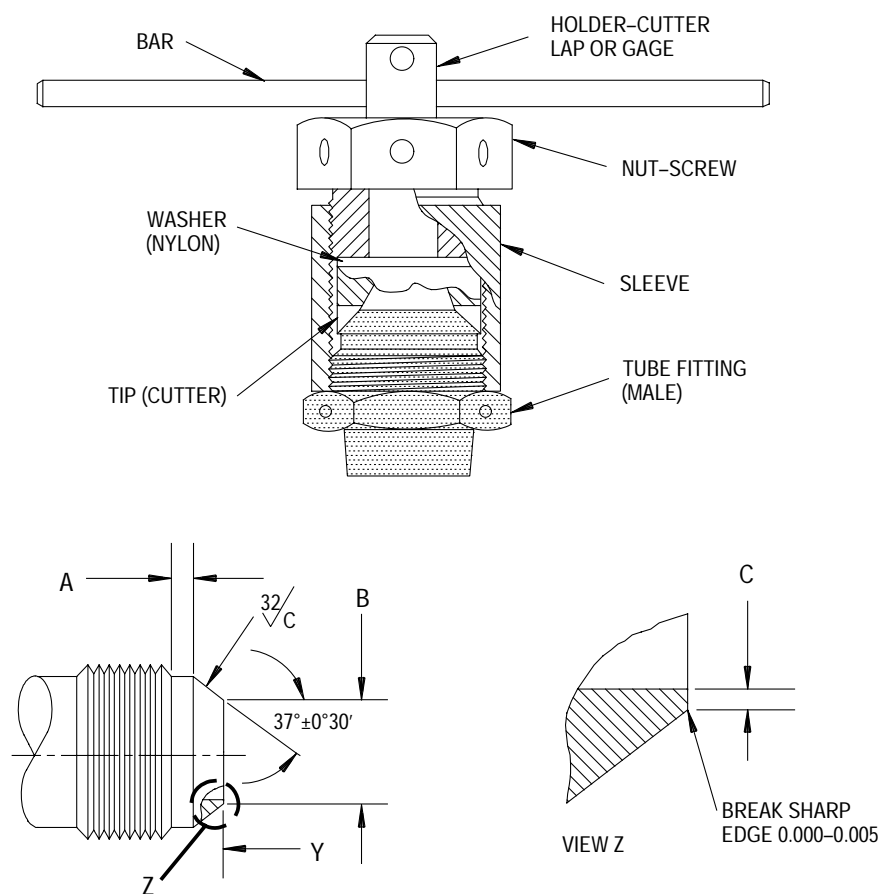
(a) Charge lapping detail of lap tool with PMC 3014 Silicone Carbide Lapping Compound, 240 grain size. Locally degrease area to be lapped.

(b) Assemble piece to tooling and handlap conical seat.

(c) Locally degrease lapped area removing all lapping compound.

(d) Inspect conical seat. Refer to WP 301 00. If necessary, repeat step a.(5).

(6) Degrease fitting. If lapping has been performed, ensure that all lapping compound has been removed. Install threaded protective cap on fitting.



THREAD	NOMINAL TUBE OD	A (MIN)	B	C (MIN)
0.4375-20	0.250	0.075	0.190 TO 0.196	0.005
0.500-20	0.3125	0.075	0.252 TO 0.258	0.005
0.5625-18	0.375	0.075	0.315 TO 0.321	0.005
0.625-18	0.4375	0.075	0.377 TO 0.383	0.005
0.750-16	0.500	0.095	0.423 TO 0.429	0.012
0.8125-16	0.5625	0.095	0.470 TO 0.476	0.012
0.875-14	0.625	0.105	0.536 TO 0.542	0.022
1.0625-14	0.750	0.105	0.661 TO 0.667	0.022
1.1875-12	0.875	0.105	0.784 TO 0.790	0.022
1.3125-12	1.000	0.125	0.910 TO 0.916	0.029
1.625-12	1.250	0.125	1.144 TO 1.150	0.029
1.875-12	1.500	0.125	1.378 TO 1.384	0.029

JL119 (51X2)

Figure 1. Male Conical Seal - Repair

b. Repair female conical seat as follows:

- (1) Select appropriate lapping tool (See tables 1 and 2.), and assemble. (See figure 2.)

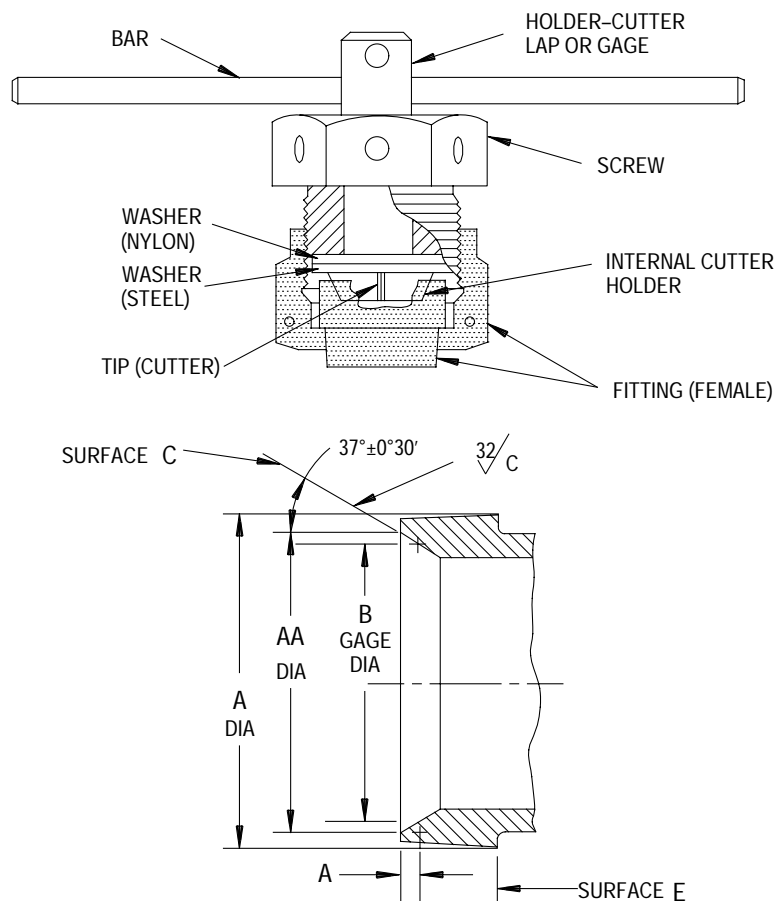
**NOTE**

Operators shall wear clean, lint-free gloves when handling reworked fittings. This is required to prevent acid-staining highly finished conical seat surface.

- (2) Rotate cutter to shave off minimum amount of material necessary to remove damage and to obtain required cone.
- (3) Surface E, figure 2, must be square with axis of Surface C within 0.005 inch FIR. Surface C must be concentric with Diameter A within 0.005 inch FIR.
- (4) Inspect conical seat. Refer to WP 301 00. If seat is acceptable omit step b.(5).

(5) Lap seat as follows:

- (a) Charge lapping detail of lap tool with PMC 3014, Silicone Carbide Lapping Compound, 240 grain size. Locally degrease area to be lapped.
  - (b) Assemble piece to tooling area and hand lap conical seat.
  - (c) Locally degrease lapped area removing all lapping compound.
  - (d) Inspect conical seat. Refer to WP 301 00. If necessary, repeat step b.(5).
- (6) Degrease fitting. If lapping has been performed, ensure that all lapping compound has been removed. Install threaded protective cap on fitting.



THREAD SIZE	NOMINAL TUBE OD	DIA A REF	GAGE DIA B	A (MAX)	DIA AA (MAX)
0.4375-20	0.250	0.380 - 0.383	0.242	0.054	0.326 *
0.500-20	0.3125	0.442 - 0.445	0.302	0.053	0.384 *
0.5625-18	0.375	0.499 - 0.502	0.358	0.049	0.434 *
0.625-18	0.4375	N/A	N/A	N/A	0.514 *
0.750-16	0.500	0.679 - 0.682	0.504	0.062	0.600 *
0.8125-16	0.5625	0.740 - 0.743	0.555	0.054	N/A
0.875-14	0.625	0.794 - 0.797	0.621	0.057	N/A
1.0625-12	0.750	0.969 - 0.972	0.769	0.072	N/A
1.1875-12	0.875	1.094 - 1.097	0.894	0.072	N/A
1.3125-12	1.000	1.219 - 1.222	1.021	0.073	N/A
1.625-12	1.250	1.531 - 1.534	1.299	0.092	N/A
1.875-12	1.500	1.781 - 1.784	1.532	0.080	N/A

\* NOTE: THIS DIAMETER MUST BE CONCENTRIC WITH DIAMETER A WITHIN 0.005 INCH FIR.

JL120(51X2)

**Figure 2. Female Conical Seat - Repair**

**5. TUBE COUPLING NUTS - REPLACEMENT (Typical).**

(See Figures 3 and 4.)

**NOTE**

Coupling nuts are secured to tubes with either thrust wire or ferrules. Step a. provides instructions for replacing wire secured nuts and step b. for replacing ferrule secured nuts.

- a. Wire secured coupling nut replacement (See figure 3.):
  - (1) Install protective plug into coupling nut to prevent grinding dust from entering tube.
  - (2) Support coupling nut in bench vise.
  - (3) Using high speed grinder and 1 1/2 inch diameter x 1/16 inch cutoff wheel, cut around nut just above wire until wire is exposed. Remove nut and wire.
  - (4) Install new coupling nut on tube.
  - (5) Support manifold assembly coupling nut in bench vise.

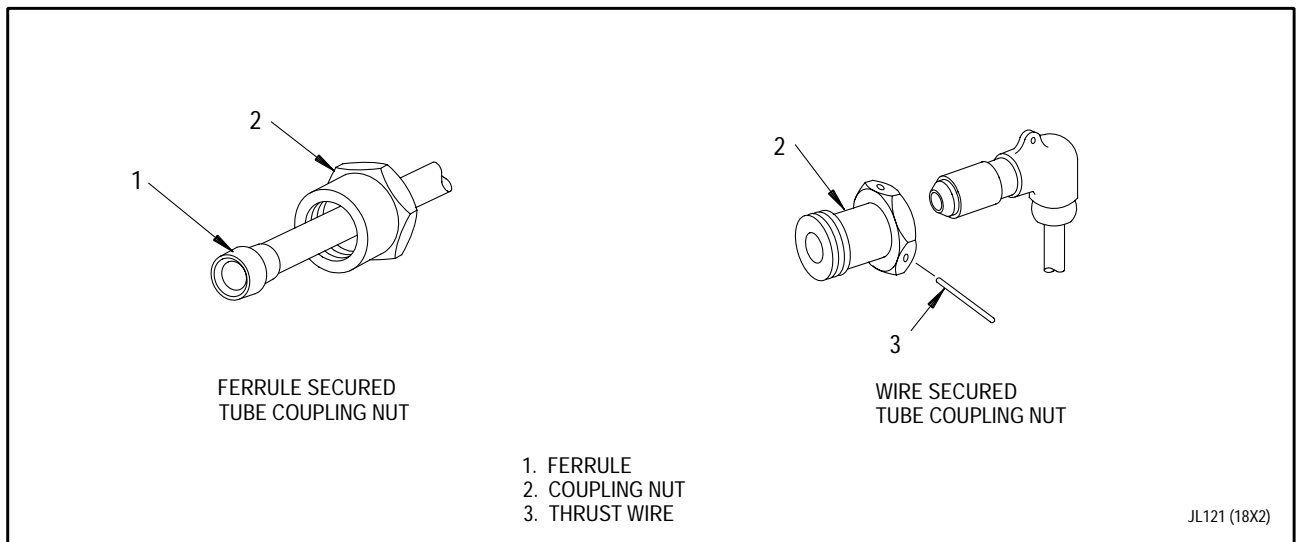
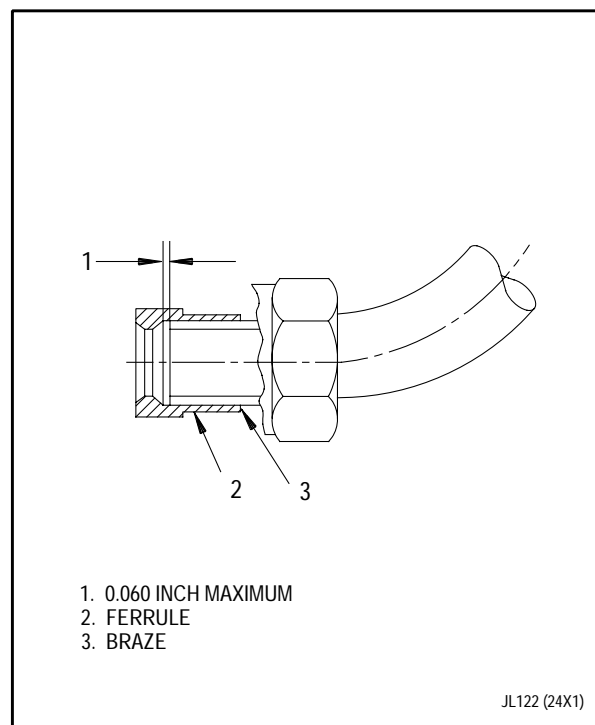
- (6) Insert thrust wire in hole of nut. Using anvil and Bantam bully air hammer, or equivalent, drive wire into position.

- b. Ferrule secured coupling nut replacement (See figure 3.):

**NOTE**

Remove ferrule with minimum of heat as overheating will result in an unstable, brittle material structure.

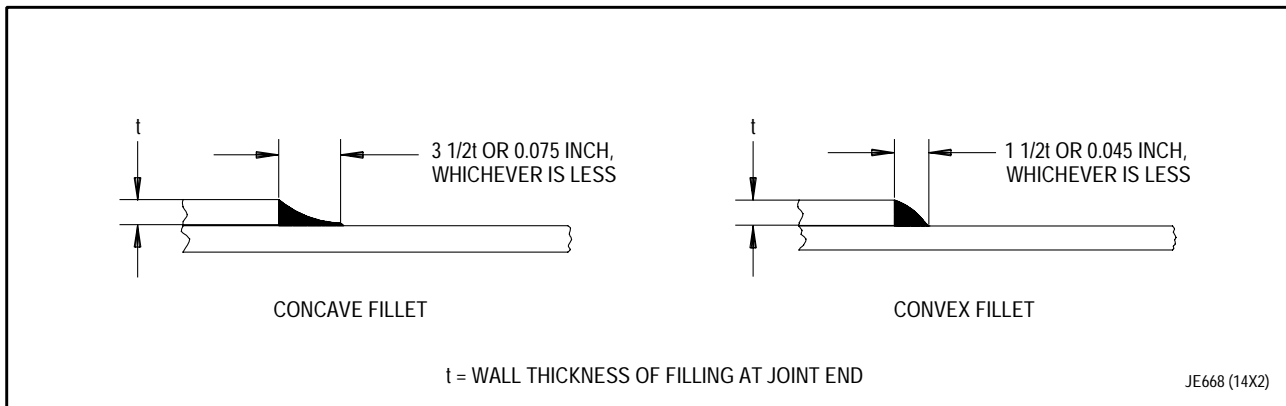
- (1) Remove ferrule from end of tube by heat melting silver-braze. Remove coupling nut.
- (2) Install new coupling nut on tube; then install ferrule. Ensure dimension (1, figure 4) is maintained. Braze per AMS 2664. Refer to T.O. 2J-F100-53-1, SWP 094 03.
- (3) Inspect braze. Refer to paragraph 6.
- (4) Pressure check tube. Refer to paragraph 8.

**Figure 3. Secured Coupling Nut Methods****Figure 4. Silver-brazed Tube Assemblies Ferrule Replacement**

## 6. TUBES AND MANIFOLD ASSEMBLIES - INSPECTION OF ALL BRAZED JOINTS.

(See Figure 5.)

- a. Exterior of brazed joints shall show complete ring of braze material around entire circumference of joint. Joints having recessed braze are not acceptable.
- b. Brazed fillets shall conform to dimensional requirements. (See figure 5.)
- c. Excess braze or staining away from fillet is acceptable provided thickness of brazed material is no greater than 0.003 inch. Braze on cone seats is not acceptable. Staining is acceptable on cone seats.
- d. Excess braze over 0.003 inch thick or scaling may be removed by light polish with crocus cloth or rag wheel without abrasive dressing, or by vapor blast. Minimum wall thickness shall be maintained.
- e. Fillet or line of braze at edges of stand-off collars (tube clamp reinforcement) may be interrupted provided that fillet or line of braze is present for at least 50% of length of each edge and that braze is evident within 25% of edge length from each corner.
- f. Perform radiographic inspection per T.O. 2J-F100-9.



**Figure 5. Acceptable Braze Fillets On Tubes and Manifold Assemblies**



**7. TUBES AND MANIFOLD ASSEMBLIES -  
STRAIGHT SECTION WELD REPAIR.**

- a. To be supplied

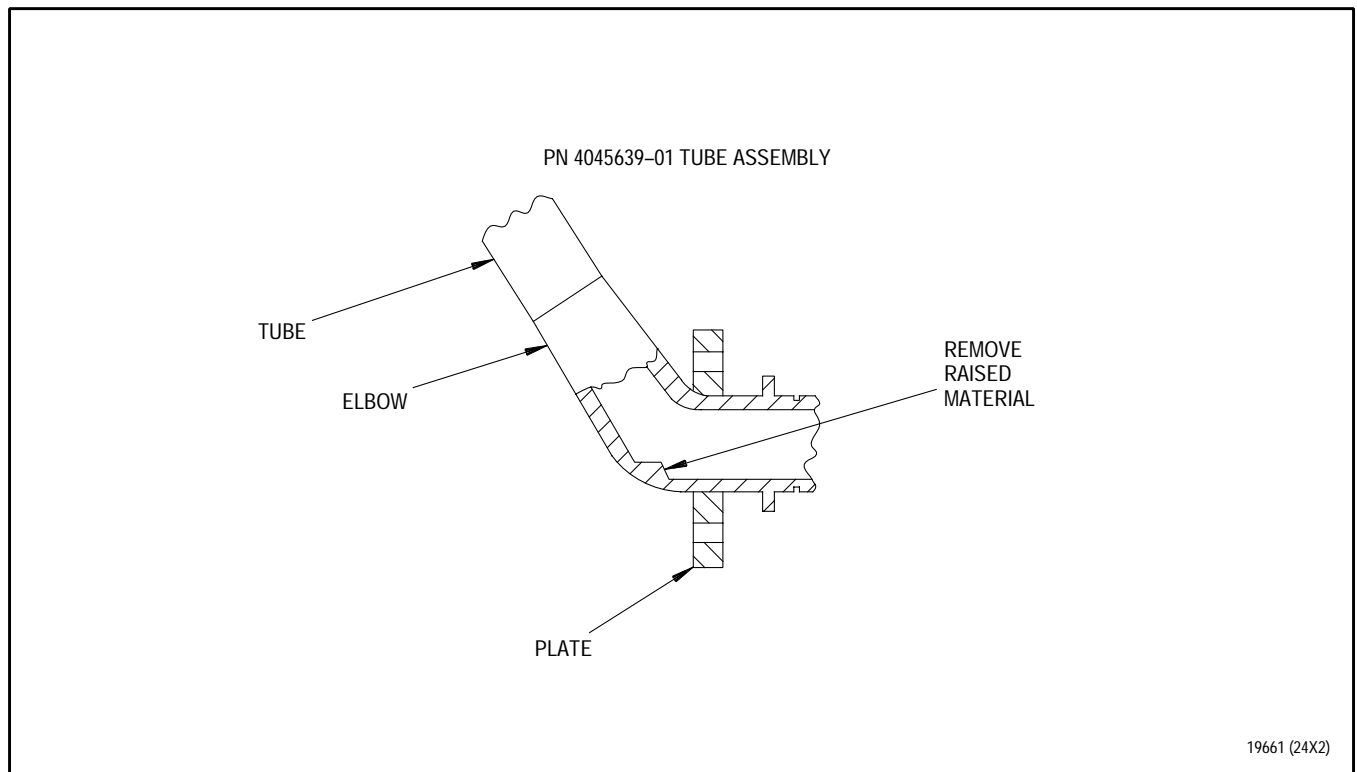
**8. MAIN OIL PUMP SCAVENGE TUBE  
ASSEMBLY - ELBOW DEBURR.**

See Figure 6.

- a. Inspect PN 4045639-01 scavenge tube for raised material in elbow. If raised material is present, deburr using rotatory file (burr ball) until surface is smooth and continuous. See figure 6.

**9. TUBES AND MANIFOLD ASSEMBLIES -  
PRESSURE CHECK.**

- a. Locally manufacture caps, plugs, etc., as required.
- b. Using standard pressure checking procedure, check tubes to 500 psi.



**Figure 6. Main Oil Pump Scavenge Tube - Deburr**



# WORK PACKAGE

## TECHNICAL PROCEDURES

### HOUSING ASSEMBLY, GEARBOX (REAR) -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 46

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 . . . . .	2	6 . . . . .	2	8 . . . . .	2
2 - 5 . . . . .	0	7 . . . . .	0	9 - 46 . . . . .	0

## REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O. 2-1-111
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Marking, General - - - - -	WP 023 00
Marking, Electro Chemical (SPOP 41) - - - - -	SWP 023 02
Cleaning, Vapor Degreaser - - - - -	SWP 031 01
Masking Procedures - - - - -	SWP 092 12
Hardcoating, Aluminum (AMS 2468) (SPOP 39) - - - - -	SWP 092 13
Anodize Touch-Up, Brush or Swab (SPOP 42) - - - - -	SWP 092 16
Welding, Inert Gas Fusion - - - - -	SWP 093 01
Heat Treatment: Stress-Relief Cycles (456) - - - - -	SWP 095 02
Painting, Zinc Chromate Primer (AMS 3110) (SPOP 157) - -	SWP 097 10
Radiographic Inspection - - - - -	T.O. 33B-1-1
General Installation of Heli-Coil Inserts - - - - -	T.O. 44H1-1-117

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

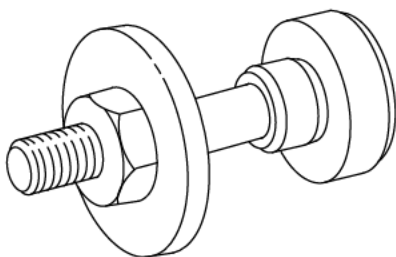
Nomenclature	Specification/Vendor Part Number
Adhesive, PWA 36047	Dow Corning Type DC 93-076 with 2 hour catalyst
Dry ice	Carbon dioxide
Filler metal	AMS 4190
Compound, sealing (PWA 36000-3)	Hylomar P1-32 or SQ 32 medium grade
Methyl ethyl ketone or	TT-M-261
Isopropyl alcohol	TT-I-735
Zinc chromate primer	AMS 3110

**EXPENDABLE ITEMS**

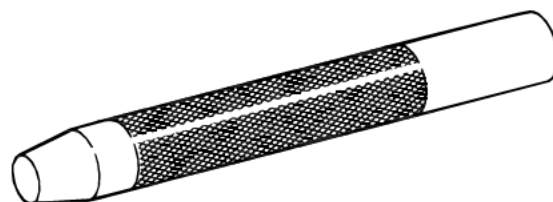
None

**APPLICABLE SUPPORT EQUIPMENT**

Paragraph	Function - Tool Nomenclature	Tool Number
3	Gearbox (Rear) Housing - Dowel Pin Replacement	
	Drift, Main gearbox housing locating pin - - - - -	PWA 51966
	Drift, Main gearbox housing locating pin - - - - -	PWA 51967
5	Gearbox (Rear) Housing - Bushing (Gearbox Oil Pump Drive) Replacement	
	Drill Jig, Gearbox oil pump drive bushing - - - - -	PWA 52514
	Drift, Gearbox oil pump drive bushing - - - - -	PWA 52515
13	Gearbox (Rear) Housing - Loose Oil Pump Drive Idler Gearshaft Bushing and Diameter at Opposite End	
	Drift, Gearbox oil pump drive bushing - - - - -	PWA 52515
17	Gearbox (Rear) Housing - Mount Bushings Replacement	
	Puller, Main gearbox mount lug bushing - - - - -	PWA 50514
	Pump, Hydraulic hand - - - - -	PWA 55380
	Go-Gage, Gearbox housing assembly mount lug bushing check - - - - -	PWA 70108
	Puller, Gearbox housing assembly mount lug bushing disassembly/assembly - - - - -	PWA 70109
	Drift, Gearbox mount lug bushing - - - - -	PWA 70110

**ILLUSTRATED SUPPORT EQUIPMENT**

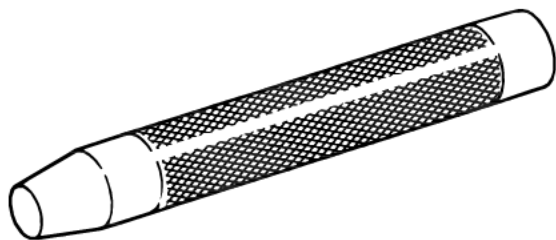
PWA 50514 -C

**Figure T1. PWA 50514 Puller**

PWA 51966 -C

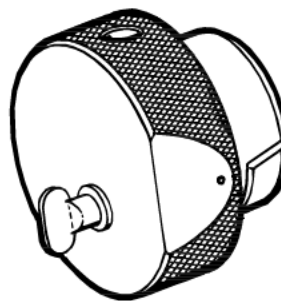
**Figure T2. PWA 51966 Drift**

ILLUSTRATED SUPPORT EQUIPMENT (continued)



PWA 51967 -C

Figure T3. PWA 51967 Drift



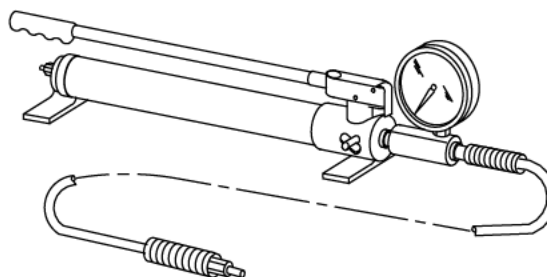
PWA 52514 -C

Figure T4. PWA 52514 Drill Jig



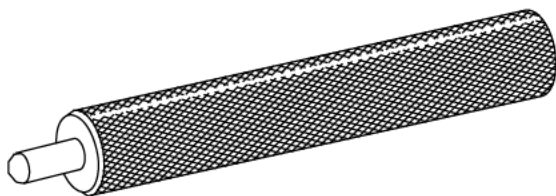
PWA 52515 -C

Figure T5. PWA 52515 Drift



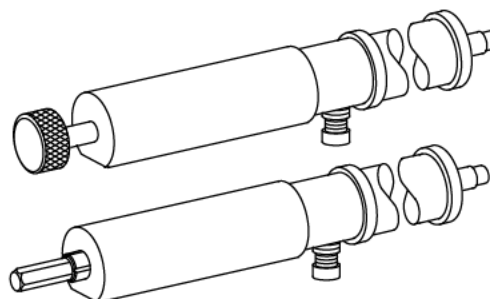
PWA 55380 -C

Figure T6. PWA 55380 Pump



PWA 70108 -C

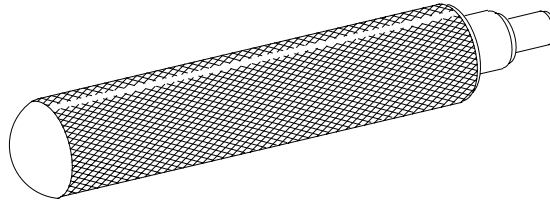
Figure T7. PWA 70108 Go-Gage



PWA 70109 -C

Figure T8. PWA 70109 Puller

**ILLUSTRATED SUPPORT EQUIPMENT (continued)**



PWA 70110 -C

**Figure T9. PWA 70110 Drift**

**1. INTRODUCTION.**

- a. This work package contains instructions for repairing the gearbox (rear) housing.

**2. GEARBOX (REAR) HOUSING - STUD REPLACEMENT.**

(See Figure 1.)

**NOTE**

For studs installed in through-holes see step b.

- a. Remove damaged stud and install replacement stud to projection length shown in figure 1.
- b. Remove damaged stud. Apply thin, even coat of PWA 36000-3 sealing compound to threads of new stud prior to installation. Wait 10 minutes. Install per figure 1.

**3. GEARBOX (REAR) HOUSING - DOWEL PIN REPLACEMENT AND BLEND REPAIR OF SURFACE SURROUNDING DOWEL PIN.**

(See figure 1 and Table 1.)

- a. If projection length is excessive, attempt to seat dowel pin(4, figure 1) to correct projection length specified.

**NOTE**

Blend repair of surface area surrounding dowel pin, step c, applies to area around item 7 only.

- b. Blend out sharp edges of cavity, removing minimum material. Cavities shall not be greater than maximum depth limit of 0.030 inch after removal of sharp edges.
- c. If pin needs to be replaced, proceed as follows:
  - (1) Remove damaged dowel pin(4).
  - (2) Chill new dowel pin.
  - (3) If required, apply wet zinc chromate primer (AMS 3110) per T.O. 2J-F100-53-1, SWP 097 10 to new dowel pin and mating hole in gearbox. (See table 1.)
  - (4) Using drift as specified in table 1 and hammer, drift dowel pin into gearbox housing.
  - (5) Check dowel pin(4) projection length with dimension specified in figure 1.



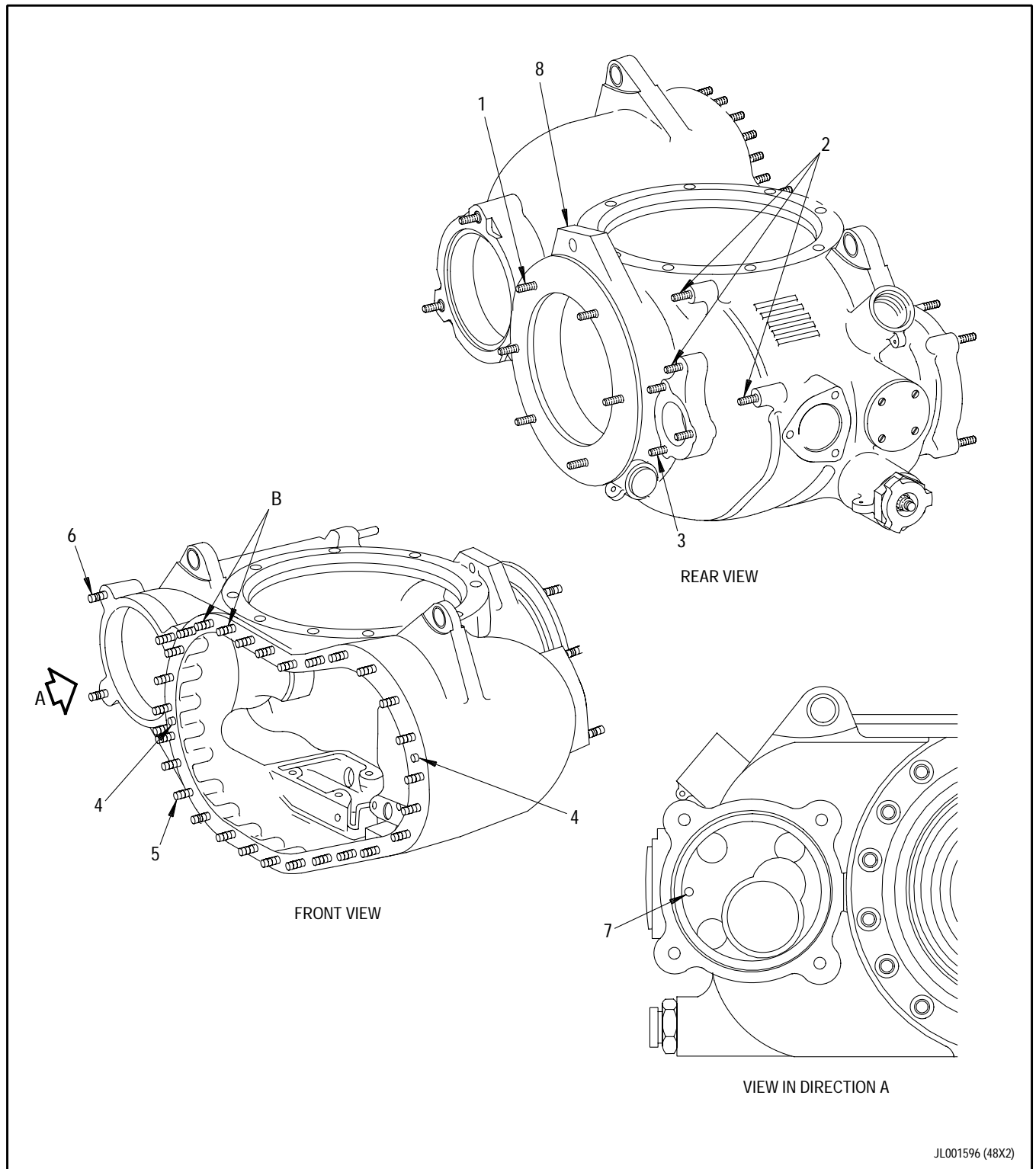


Figure 1. Gearbox (Rear) Housing - Stud and Dowel Pin Replacement

**Legend for figure 1**

1. Stud, 6 required, 1.067 to 1.087 inches projection length. Torque 160 to 475 pound-inches.
2. Stud, 0.868 to 0.888 inch projection length. Torque 40 to 120 pound-inches.
3. Stud, 3 required, 0.625 to 0.645 inch projection length. Torque 40 to 120 pound-inches.
4. Dowel pin, 2 required, 0.115 to 0.135 inch projection length
5. Stud, 26 required, 0.740 to 0.760 inch projection length. Apply thin, even coat of PWA 36000-3 sealing compound to threads of studs at Location B prior to installation, wait 10 minutes, and immediately torque 40 to 120 pound-inches. Torque 24 remaining locations 40 to 120 pound-inches.
6. Stud, 4 required, 0.840 to 0.860 inch projection length. Torque 40 to 120 pound-inches.
7. Dowel pin, 1 required 0.180 to 0.200 inch projection length
8. Rear mount lug

**Table 1. Gearbox Rear Housing Assembly -Dowel Pin Installation Tools**

Dowel Pin Location	Primer Required	Tool Number	Tool Name
Gearbox front housing mount pad (Figure 1, item 4)	Zinc chromate (AMS 3110)	PWA 51967	Drift
No. 2 and 3 bearing scavenge pump mount pad (Figure 1, item 8)	None	PWA 51966	Drift

#### 4. GEARBOX (REAR) HOUSING - INSERT REPLACEMENT.

(See Figure 2.)

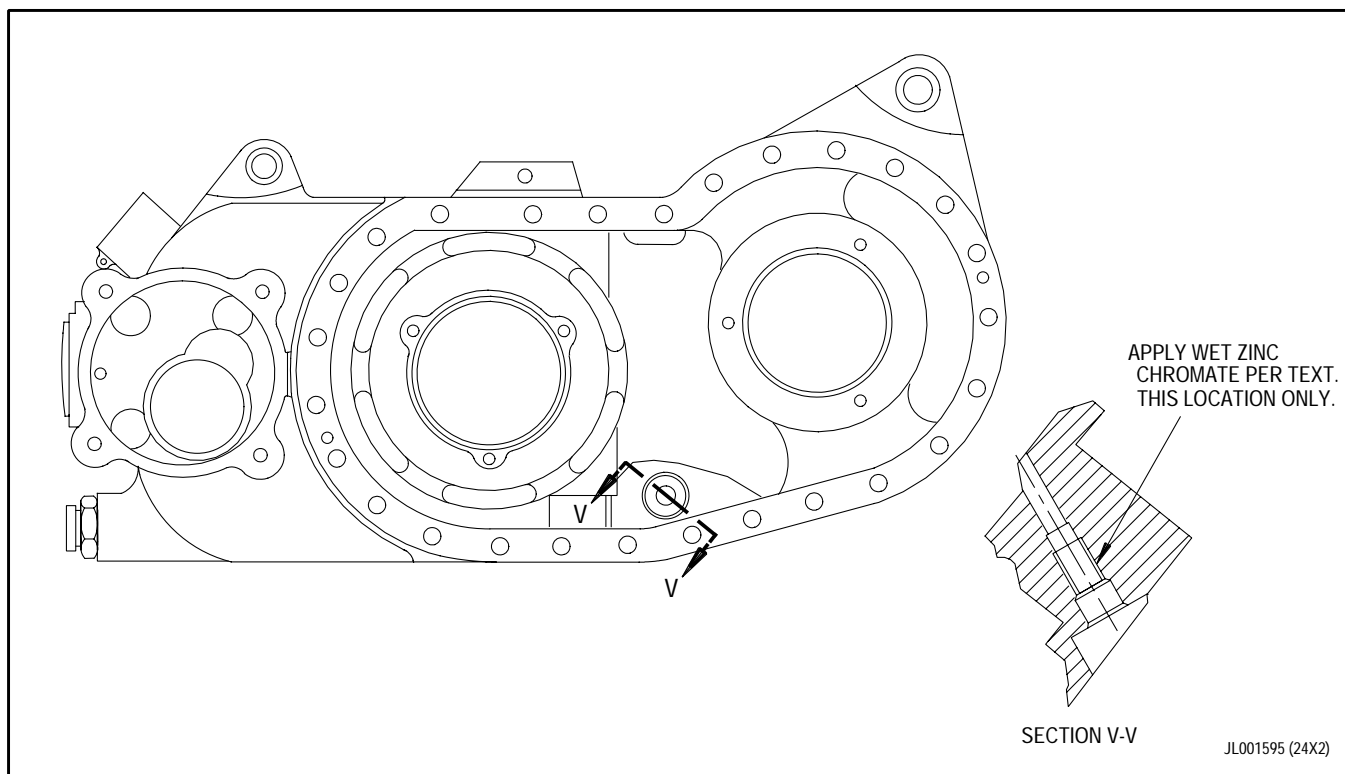
- a. Remove damaged insert using Heli-Coil extractor tool No. 1227-6.
- b. Apply wet zinc chromate primer (AMS 3110) per T.O. 2J-F100-53-1, SWP 097 10 to new insert and matching hole in gearbox.
- c. Install new insert using Heli-Coil inserting tool as follows:

Insert PN	Tool No.
MS124658	7552-6
MS124695	7552-3
MS124736	7552-4

#### NOTE

Insert shall be 1.0 to 1.5 pitch below surface.

- d. Break off tang at notch using Heli-Coil tang break off tool No. 3692-5, No. 3605-3, or No. 3692-6.



**Figure 2. Wet Zinc Chromate Primer Application for Helicoil Insert - Replacement**

**5. GEARBOX (REAR) HOUSING - BUSHING (OIL PUMP DRIVE IDLER GEARSHAFT REPLACEMENT.**

(See Figure 3.)

- a. Locate pin passing through bushing(8) into gearbox housing. Temporarily mark position of pin location on pad.
- b. Remove unserviceable bushing by machining.
- c. Chill replacement bushing(8).
- d. Install replacement bushing using PWA 52515 drift and standard arbor press.
- e. Install PWA 52514 drill jig and secure with thumbscrew detail.
- f. Drill replacement pinhole(5) in bushing(8) and housing.
- g. Remove PWA 52514 drill jig.
- h. Install new pin.
- i. Clean up machine to dimensions in figure 3 at opposite gearshaft bearing housing location.
- j. Fluorescent penetrant inspect machined surface per T.O. 2J-F100-9. No cracks permitted.

- k. Remove anodize in areas to be plated.
- l. Nickel plate per SPOP 43 in T.O. 2-1-111. Plating outside of enclosed area is permissible, provided excess plate is removed. Plate thickness shall be 0.003 to 0.011 inch thick after final machining.
- m. Finish machine to dimensions shown.
- n. Permanently identify with beehive symbol per SPOP 401 deep etch in area near part number per T.O. 2J-F100-53-1, SWP 023 02.
- o. Anodize touch-up repair all bared external surfaces per T.O. 2J-F100-53-1, SWP 092 16 (SPOP 42).

**6. GEARBOX (REAR) HOUSING - BUSHING (OIL PUMP DRIVE IDLER GEARSHAFT) - BLEND REPAIR.**

- a. Blend and smooth out scoring on surface of bore.

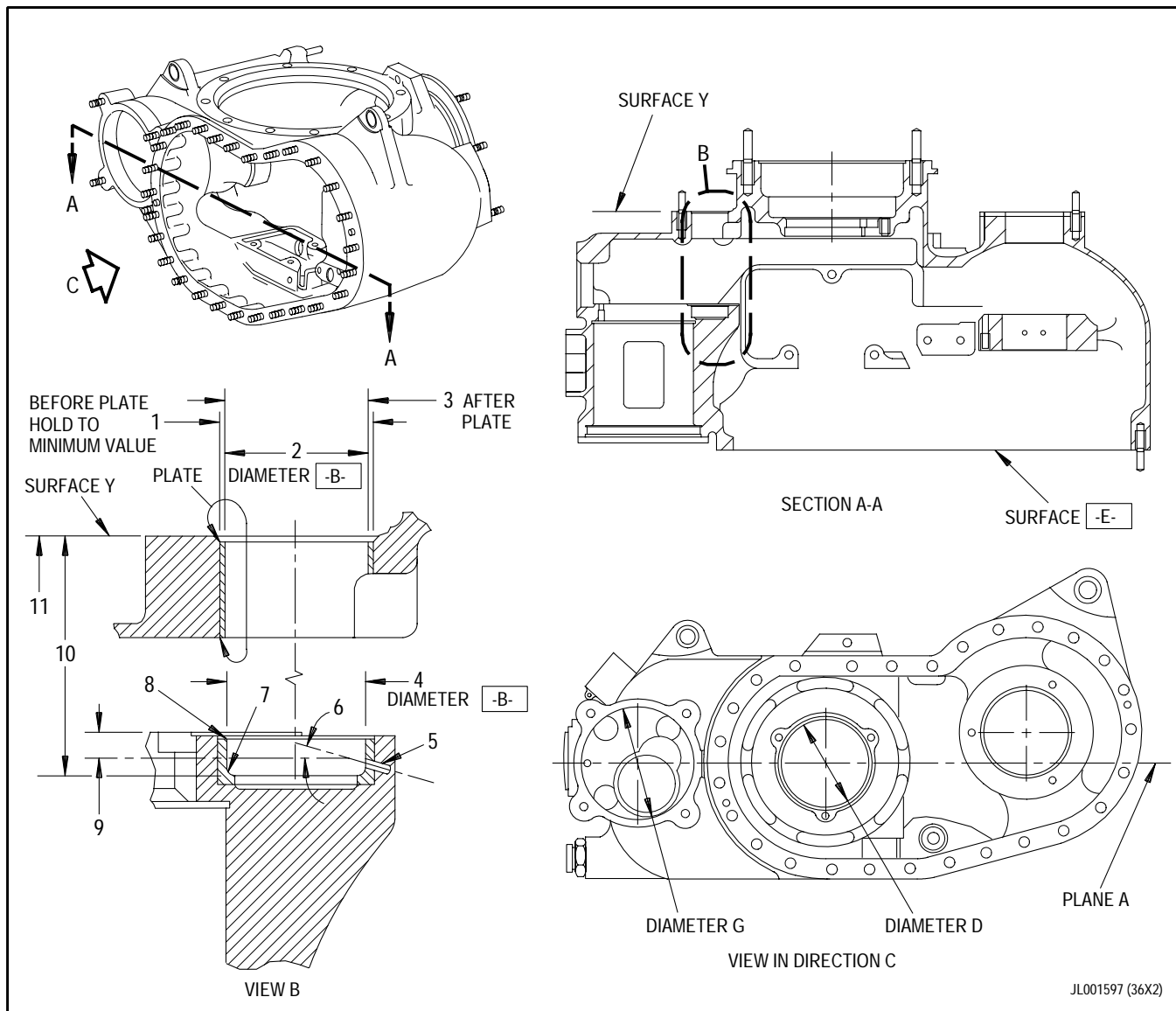


Figure 3. Gearbox (Rear) Housing Assembly - Bushing Replacement

**Legend for figure 3****NOTE**

The centerline formed by Diameter B and C shall be square with Surface Y within 0.001 inch total and located within 0.001 inch total of true position in relation to Diameter D and Plane A. Unless otherwise specified, all dimensions apply when Surface E is flat within 0.001 inch total in free state or constrained. Constraint contact allowed only on Surface E. In free state Surface E shall be flat within 0.002 inch total.

1. 1.242 to 1.255 inch diameter, before plate. Hold to minimum value.
2. 1.2335 to 1.2345 inch diameter.
3. 1.223 inch diameter maximum, after plate.
4. 1.1013 to 1.1018 inches
5. Drill pin hole 0.060 to 0.062 inch diameter to depth of 0.140 to 0.180 inch. Locate within 0.010 inch radius of true position on an arc plus or minus 135 degrees of Plane A, into thicker parent material.
6. 15 degrees
7. 0.005 to 0.012 inch radius
8. Bushing
9. 0.200 inch
10. 3.292 to 3.294 inches
11. 7.543 to 7.547 inches to Surface E.

**7. GEARBOX (REAR) HOUSING ASSEMBLY -  
MAIN (OIL SCAVENGE) PUMP CAVITY  
ALUMINUM HARDCOATING REPAIR.** (See  
Figure 4.)

**NOTE**

Hardcoat is approximately 50% buildup and 50% penetration. Stripping of coating (.0010 to .0045 finished thickness) alters dimension of base aluminum. Parts that will be dimensionally acceptable after coating should be stripped and coated per SPOP 39 in T.O. 2-1-111 final dimension per figure 4. For deeper wear proceed with the following instructions.

- a. Remove pin(18) by pushing on rear of pin through pilot hole.

**NOTE**

Gearbox housing is AMS 4215 aluminum alloy.

- b. Strip hardcoat in area shown(2) per SPOP 39 in T.O. 2-1-111.
- c. Clean up machine to dimensions(9, 10 and 14).

- d. Fluorescent penetrant inspect machined surfaces per T.O. 2J-F100-9. No cracks permitted.
- e. Nickel plate per SPOP 43 in T.O. 2-1-111. Plating outside of enclosed area is permissible, provided excess plate is removed. Plate thickness shall be 0.003 to 0.011 inch thick after final machining.
- f. Finish machine to dimensions in figure 4.
- g. Permanently identify with beehive symbol in area near part number using deep etch method per T.O. 2J-F100-53-1, SWP 023 02.
- h. Install dowel pin per paragraph 3.
- i. Anodize touch-up all repaired bare metal exterior surfaces per T.O. 2J-F100-53-1, SWP 092 16.



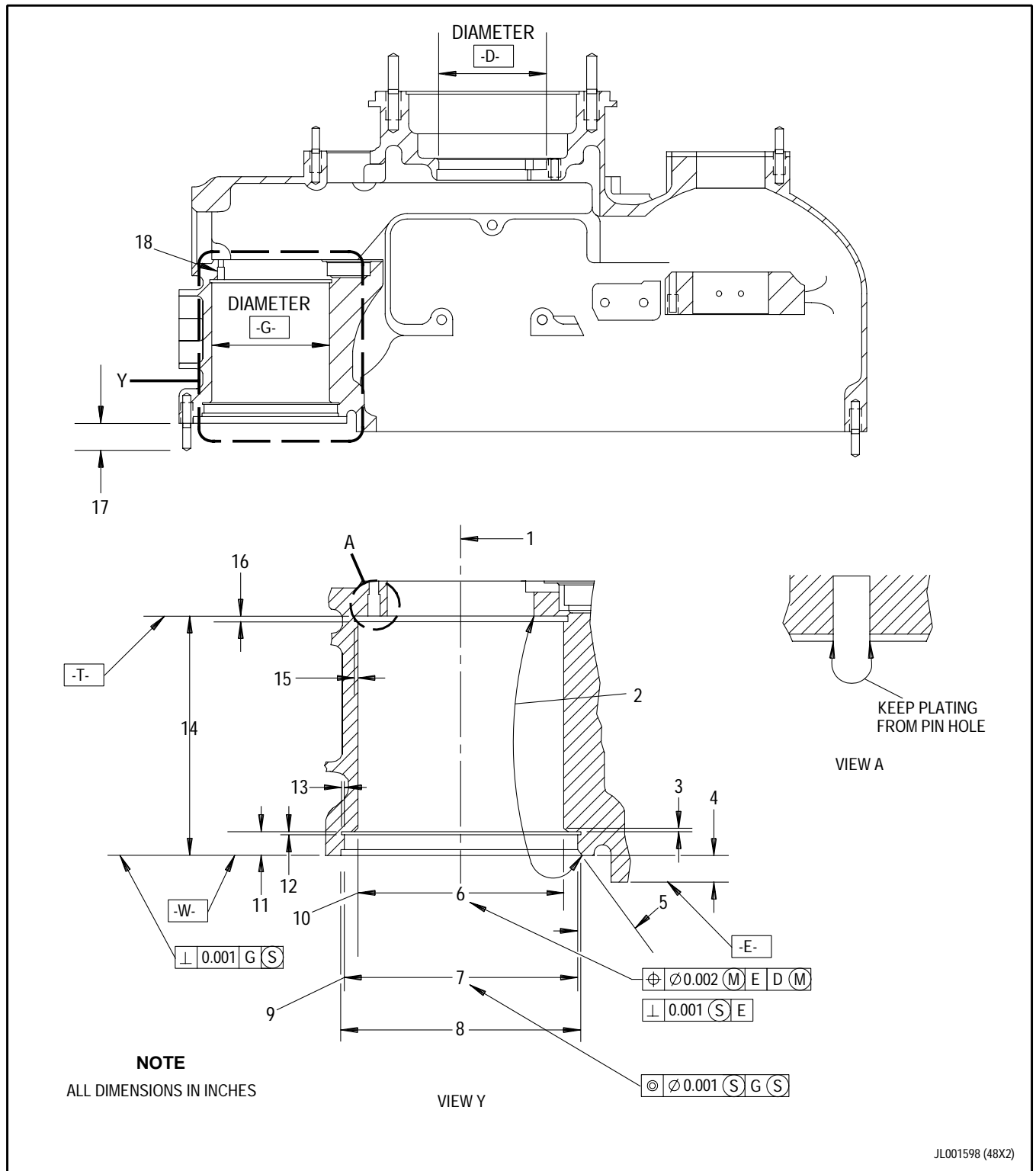


Figure 4. Gearbox (Rear) Housing Assembly - Main (Oil Scavenge) Pump Cavity Aluminum Hardcoating

**Legend for figure 4**

1. 6.129 inches to centerline Diameter D
2. Strip hardcoat in included area all around. Nickel plate enclosed area. Nickel plate required on Diameters G, P and Surface T. Other areas optional and may be incomplete.
3. Chamfer 0.030 to 0.050 inch x 45° ±5°
4. 0.253 to 0.257 inch reference
5. 20° ±2°
6. 3.2605 to 3.2635 inch Diameter G. This diameter shall be located within 0.002 inch of true position in relation to Surface E and Diameter D. The tolerance applies at maximum material for this diameter and Diameter D. This diameter regardless of feature size shall be perpendicular to Surface E within 0.001 inch.
7. 3.672 to 3.673 inch Diameter P. This diameter regardless of feature size shall be concentric within 0.001 inch diameter of true position with respect to Diameter G regardless of feature size.
8. 3.720 to 3.740 inch diameter. This diameter regardless of feature size shall be concentric within 0.010 inch diameter of true position with respect to Diameter P regardless of feature size.
9. Clean up machine 3.679 to 3.694 inch diameter. Hold to minimum value. Nickel plate to 3.662 inch diameter maximum. Finish to(7) Diameter P.
10. Clean up machine 3.270 to 3.282 inch diameter. Hold to minimum value. Nickel plate to 3.250 inch diameter maximum. Finish to(6) Diameter G.
11. 0.390 to 0.410 inch
12. 0.040 to 0.060 inch
13. 0.000 to 0.010 inch
14. Clean up machine 3.805 to 3.809 inches from Surface W. Hold to minimum value. Nickel plate to 3.793 inch maximum. Finish 3.798 to 3.802 inches.
15. 0.000 to 0.010 inch
16. 0.040 to 0.060 inch
17. 0.840 to 0.860, 4 places maximum
18. Dowel pin, 0.180 to 0.200 inch projected length.
19. This surface shall be perpendicular to Diameter G within 0.001 inch regardless of feature size of Diameter G.

**8. GEARBOX (REAR) HOUSING ASSEMBLY -  
PROCEDURE FOR RESECURING LOOSE  
COMPANY NAME IDENTIFICATION PLATES.**

- a. When company name plate, (eagle) is loose in identification plate frame it may be secured using a four ounce ball peen hammer, by carefully tapping all round edge of frame, tighten edge over and down against face of eagle.

**NOTE**

If unable to secure identification plate tightly, remove and replace per paragraph 9.

**9. GEARBOX (REAR) HOUSING ASSEMBLY -  
COMPANY NAME IDENTIFICATION PLATE  
REPLACEMENT.**

- a. Remove name plate by straightening edge of identification plate frame. Remove name plate. Remove screws securing frame and name plate mount disk spacer.
- b. Discard identification plate frame and name plate mount disk spacer.
- c. Assemble new identification plate frame and name plate mount disk spacer, (slots in frame located at approximately 2 and 10 o'clock position when installed on gearbox), to circular pad next to triangular boss. Apply PWA 36003 sealant between plate frame.
- d. Secure in place with screws. Torque screw. Stake each screw, stake impression into mount disk per T.O.2-1-111, PWA 361.
- e. Assemble company name plate to frame with wings located in slots. Using four ounce ball peen hammer, tap all around edge at frame to form edge over and down against face of eagle to hold it securely in place.

**10. GEARBOX (REAR) HOUSING  
ASSEMBLY - WELD REPAIR OF CRACKS.**

(See Figure 5.)

**NOTE**

Parent material is AMS 4215.

- a. Repair cracks in 0.120 to 0.180 inch outer wall (figure 5, View A) as follows:

- (1) Fluorescent penetrant inspect per T.O. 2J-F100-9 to determine size and location of crack.

**NOTE**

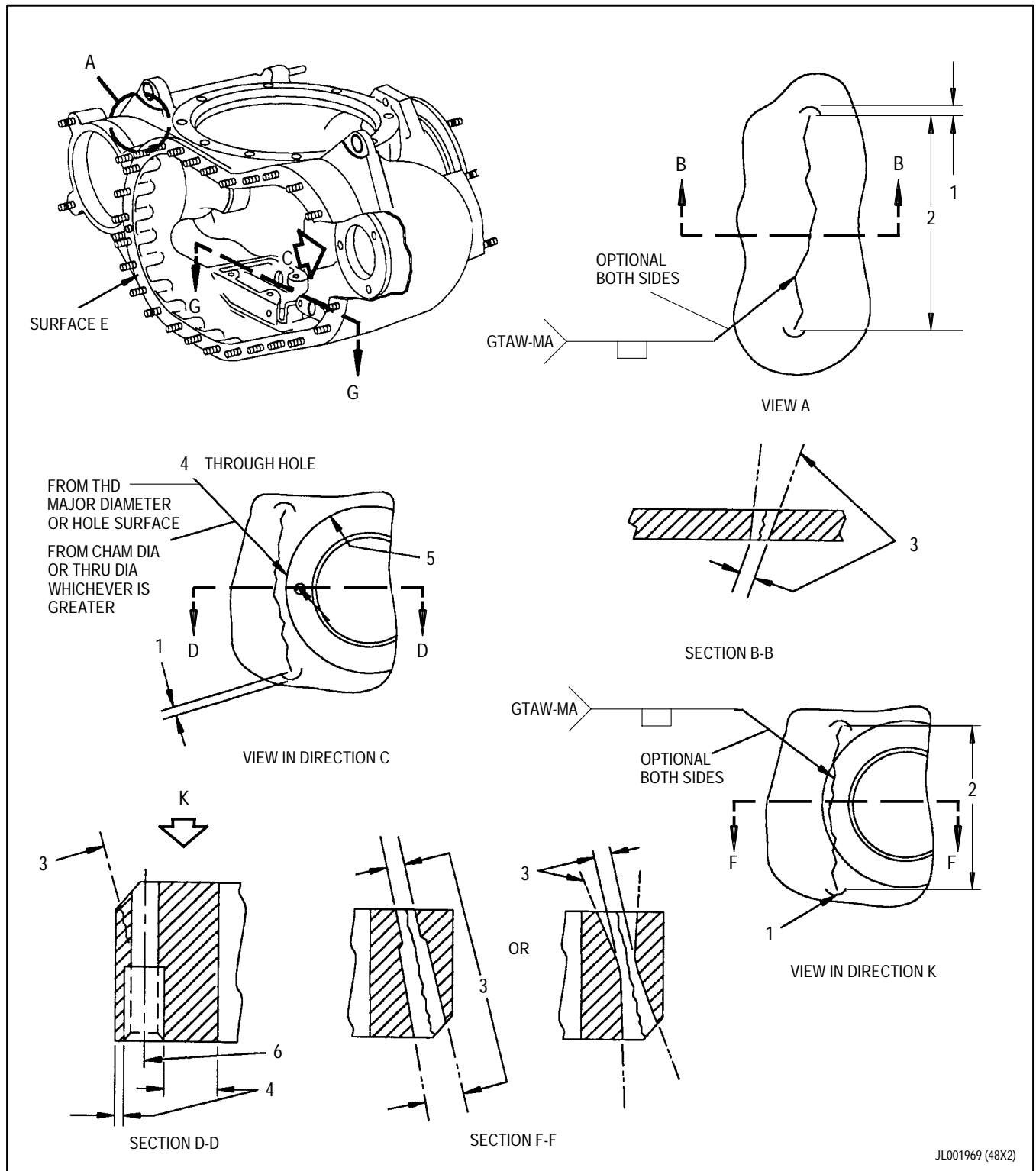
Any cracks within 0.080 inch of the opposite side shall be routed all the way through wall.

- (2) Rout by following line of crack as shown in figure 5.
- (3) Radiographic (X-ray) inspect per T.O. 33B-1-1 to ensure all of crack has been routed out of wall.
- (4) Vapor degrease per T.O. 2J-F100-53-1, SWP 031 01, except suspend in degreasing vapors.

**NOTE**

Preheating of housing is permitted to 400°F (204°C) maximum temperature immediately before welding.

- (5) Weld per PWA 16-4 per T.O. 2J-F100-53-1, SWP 093 01 using AMS 4190 filler metal.
- (6) Stress-relieve at 335° to 365°F (168° to 185°C) for two hours.
- (7) Machine excess weld to maximum internal weld bead height of 0.150 inch.
- (8) Radiographic inspect per T.O. 33B-1-1 and SXRS 33 per T.O. 2-1-111.
- (9) Fluorescent penetrant inspect per T.O. 2J-F100-9. No cracks allowed, no visual distortion of repair area or areas adjacent to weld area permitted.
- (10) Anodize touch up all external repaired areas per T.O. 2J-F100-53-1, SWP 092 16.
- (11) Dimension inspect repair area and areas adjacent to weld.



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Figure 5. Gearbox (Rear) Housing Assembly - Weld Repair of Cracks (Sheet 1 of 2)

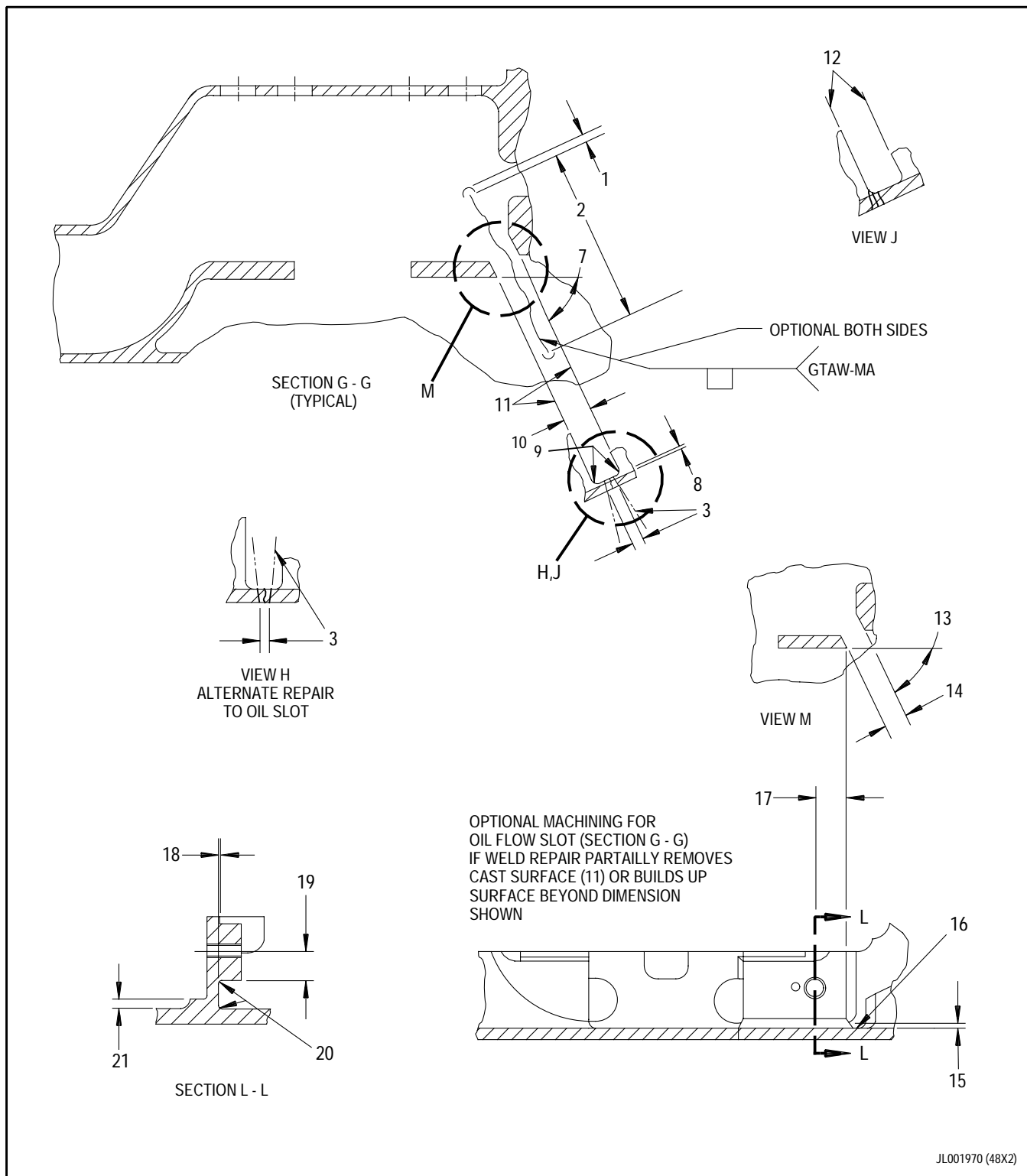


Figure 5. Gearbox (Rear) Housing Assembly - Weld Repair of Cracks (Sheet 2 of 2)

**Legend for figure 5****NOTE**

Constrain only on Surface E. Unless otherwise specified, all dimensions apply when Surface E is flat within 0.001 in total, in free state, or constrained. In free state Surface E shall be flat within 0.002 inch total.

1. Machine 0.060 inch maximum from end of crack to runout of radius, both ends
2. 4.000 inches maximum
3. Weld preparation per Groove V or U on any slot cut 0.080 inch or greater in depth. Maintain root opening as small as practical for 0.030 inch minimum. Contour of routing tool is optional.
4. No weld material permitted within this area. 0.050 inch minimum. (Typical all holes or threads)
5. Blend following boss contour
6. Remove thread insert within 1.000 inch of any repair before welding.
7. 65 degrees (reference)
8. Machine excess weld to within 0.005 inch of cast configuration on this surface and on all repairs on bottom of housing.
9. 0.062 to 0.125 inch modified radius (reference)
10. 0.540 to 0.600 inch
11. Oil slot cast surface
12. If machining oil slot partially removes either of these surfaces, machine slot to depth of crack only.
13.  $45^{\circ} \pm 2^{\circ}$
14. 0.500 to 0.530 inch
15. 0.000 to 0.030 inch
16. 0.125 to 0.188 inch modified radius, both sides of slot shown
17. 0.240 to 0.260 inch
18. 0.000 to 0.030 inch
19. 0.185 to 0.225 inch
20. 0.062 to 0.125 modified radius
21. 0.000 to 0.030 inch

- b. Repair cracks through boss by repeating step a.(1) through (10). (View C)
- c. Repair cracks through sump wall and oil flow slot areas as follows: (Section G-G typical)
  - (1) Repeat step a.(1) through (7).
  - (2) Inspect areas under button boss and oil flow slot surfaces for weld buildup.
  - (3) Machine out local passage or oil flow slot if obstructed as shown by (8). Views J and H.
  - (4) Repeat step a.(8) through (10).

**11. GEARBOX (REAR) HOUSING  
ASSEMBLY - WELD REPAIR OF CRACKS  
AROUND AND THROUGH MAIN (TOP) MOUNT  
FLANGE.**

(See Figure 6.)

**NOTE**

Parent material is AMS 4215.

- a. Repair cracks around and through main (top) mount flange as follows:
  - (1) Repeat step a.(1) through (6), paragraph 10.
  - (2) Machine weld any weld buildup on flange face in repair area to dimensions shown.
  - (3) Repeat step a.(8) through (11), paragraph 10.
  - (4) Inspect to ensure tolerance specified in(14, figure 6) is maintained.





**Legend for figure 6**

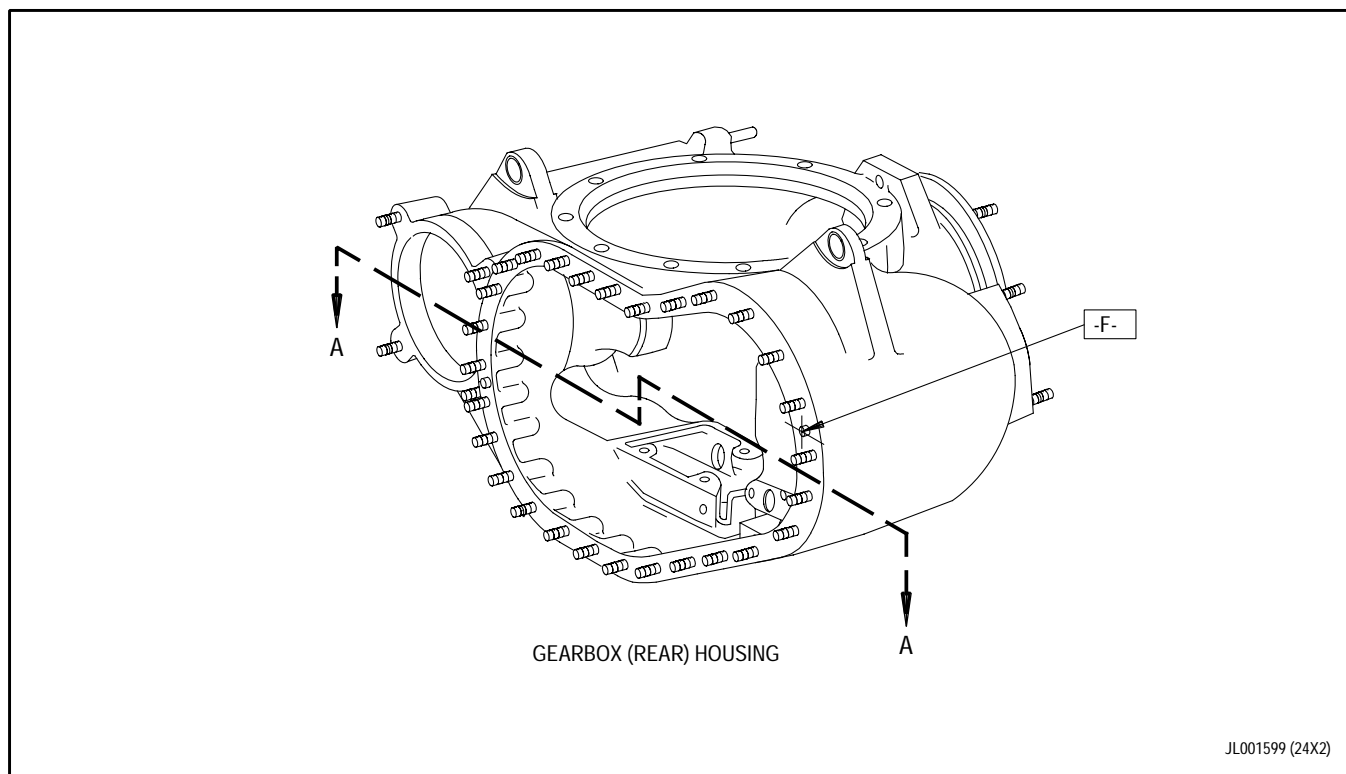
1. 3.875 inches
2. No weld material permitted within 0.100 inch minimum from threaded major diameter. Typical 6 places.
3. 0.219 to 0.281 inch modified weld radius. Blend smoothly over adjacent surface.
4. Any threaded insert located within 1.000 inch of any weld repair shall be removed prior to welding.
5. Machine 0.060 inch maximum from end of crack to runout of radius. (Both ends).
6. 4.000 inch maximum along contour.
7. Break weld edge 0.040 to 0.060 inch modified radius. Blend smoothly with adjacent surface.
8. Rout all cracks completely and follow line of crack. Any crack within 0.080 inch of the opposite side shall be routed all the way through wall. Weld preparation per Groove V or U on any slot cut 0.080 inch or greater in depth. Maintain root opening as small as practical for 0.030 inch minimum. Contour of routing tool is optional.
9. Diameter X. 6.2995 to 6.3015 inches
10. Undercut 0.125 to 0.135 inch
11. 0.005 to 0.015 inch modified radius
12. Undercut 0.082 to 0.088 inch
13. 0.050 inch minimum
14. Machine weld 0.000 to 0.005 inch below Surface S. Blend smoothly with adjacent surface. Machine area shall not intrude within area(13). Inspect Surface S and groove after weld to ensure dimensions(9), (10), (12) and (15) are within tolerances specified.
15. 3.511 to 3.513 inches to centerline Diameter D
16. Diameter X, regardless of feature size, shall be located within 0.002 inch diameter of true position in relation to Surface E and Diameter D, regardless of feature size of Diameter D.
17. Diameter X, regardless of feature size, shall be parallel to Surface E within 0.0005 inch diameter.

**12. GEARBOX (REAR) HOUSING  
ASSEMBLY - PLATE REPAIR OF BREATHER  
PRESSURIZING VALVE AND ADJACENT  
MOUNTING SURFACES.** (See Figure 7.)

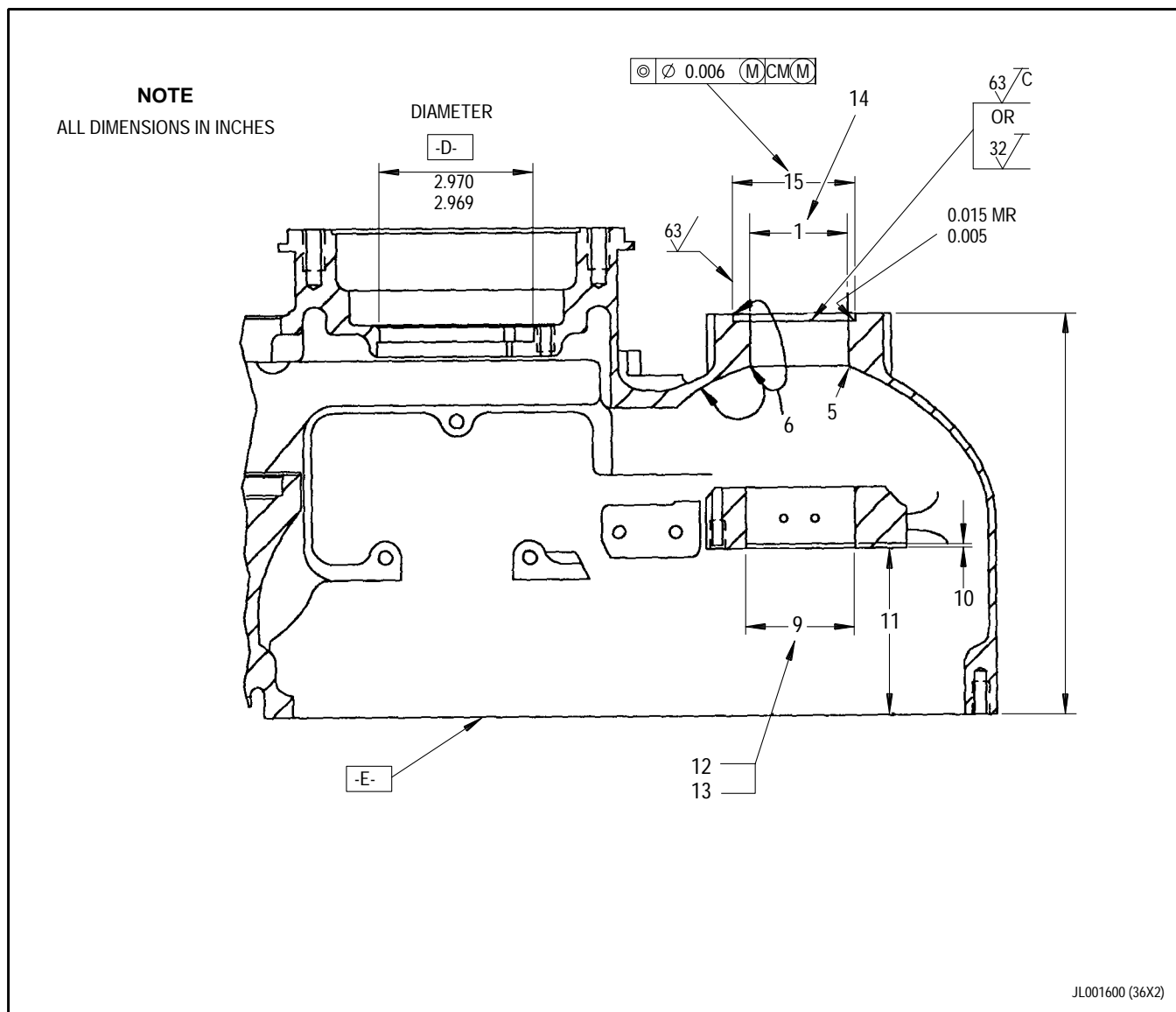
a. Nickel plate main top mount flange, preformed packing groove and main pilot diameter as follows:

- (1) Machine to dimensions shown. If machining does not clean up entire surface, discontinue this procedure.
- (2) Fluorescent penetrant inspect machined surface per T.O. 2J-F100-9. No cracks permitted.

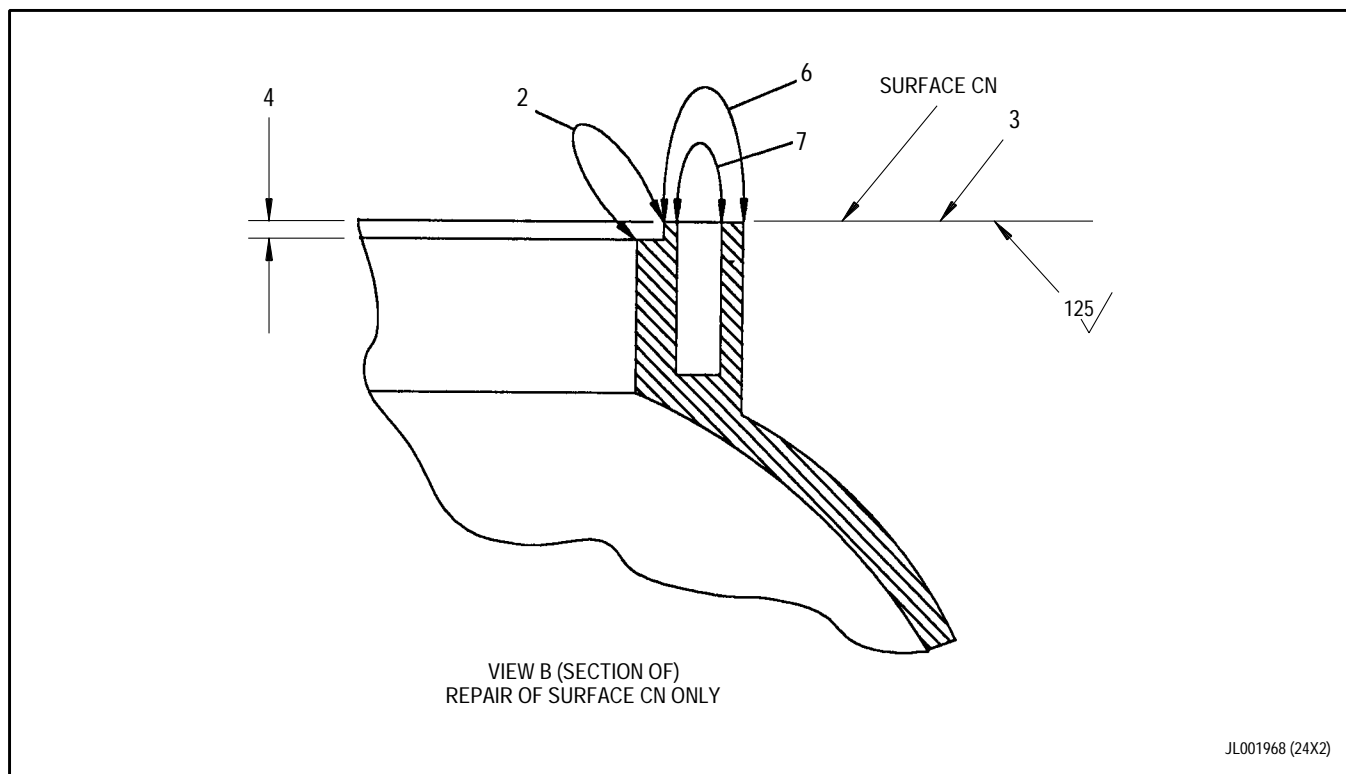
- (3) Remove anodize where required in areas to be plated.
- (4) Nickel plate per SPOP 43 in T.O. 2-1-111.
- (5) Machine to dimensions shown.
- (6) Mark with beehive symbol in area near part number. Refer to T.O. 2J-F100-53-1, SWP 023 02.
- (7) Paint or touch-up bare external surface. Refer to T.O. 2J-F100-53-1, SWP 092 16.



**Figure 7. Gearbox (Rear) Housing Assembly - Plate Repair for Breather Pressurizing Value and Adjacent Mounting Surfaces (Sheet 1 of 3)**



**Figure 7. Gearbox (Rear) Housing Assembly - Plate Repair for Breather Pressurizing Valve and Adjacent Mounting Surfaces (Sheet 2 of 3)**



**Figure 7. Gearbox (Rear) Housing Assembly - Plate Repair for Breather Pressurizing Valve and Adjacent Mounting Surfaces (Sheet 3 of 3)**

**Legend for figure 7**

1. 2.524 to 2.527 inches diameter before plating. Hold to minimum value. 2.503 inches diameter maximum after plating. 2.514 to 2.518 inches finish diameter. Diameter cm.
2. Plate or coat optional and may be incomplete. Dimensions 4 and 15 shall be met.
3. This surface shall be parallel within 0.001 inch of Surface E.
4. 0.082 to 0.088 inch.
5. Smooth transition between parent material and plating required.
6. Nickel plating area.
7. Do not plate in holes on this surface.
8. 7.479 to 7.483 inches before plating. Hold to maximum value. 7.494 inches minimum after plating. 7.485 to 7.489 inches finish dimension.
9. Diameter Y. 2.444 to 2.450 inches diameter before plating. 2.426 inches diameter maximum after plating. 2.4369 to 2.4379 inches finish diameter.
10. Chamfer 0.060 to 0.080 inch x 45° ±2°.
11. 3.124 to 3.128 inches
12. This diameter regardless of feature size shall be perpendicular within 0.001 inch to Surface E.
13. This diameter at maximum material condition shall be located within 0.002 inch of true position in relation to Surface E, diameter F at maximum material condition, and diameter D at maximum material condition.
14. Diameter(1) and Diameter AV shall be aligned within 0.001 inch MMC.
15. 2.758 to 2.761 inches before plating. Hold to minimum. 2.740 inches maximum after plating. 2.745 to 2.755 inches finish diameter.

**13. GEARBOX (REAR) HOUSING - REPAIR OF  
LOOSE OIL PUMP DRIVE IDLER GEARSHAFT  
BUSHING AND DIAMETER AT OPPOSITE END.**

(See Figure 8.)

- a. Locate pin passing through bushing into gearbox housing. Temporarily mark position of pin location on pad.
- b. Remove bushing by machining.
- c. Clean up machine both ends to dimensions(1 and 9).
- d. Fluorescent penetrant inspect per T.O. 2J-F100-9. No cracks permitted.
- e. Remove anodize in areas to be plated.
- f. Nickel plate per SPOP 43 in T.O. 2-1-111. Plating outside of enclosed area is permissible, provided excess plate is removed. Plate thickness shall be 0.003 to 0.011 inch thick after final machining.
- g. Machine plated area at bushing end only to dimension(11).
- h. Chill replacement bushing.

- i. Install replacement bushing using PWA 52515 drift and standard arbor press.

- j. Install new pin per paragraph 5.

**NOTE**

Centerline formed by Diameter B and C shall be square with Surface E within 0.001 inch total and located within 0.001 inch total of true position in relation to Diameter D and Plane E. All dimensions apply when Surface E is flat within 0.001 inch total in free state or constrained. Constraint contact allowed only on Surface E. In free state Surface E shall be flat within 0.002 inch total.

- k. Machine to dimensions (3 and 5).
- l. Permanently identify with beehive symbol per T.O. 2J-F100-53-1, SWP 023 02 in area near part number.
- m. Anodize touch-up repair all bare external surfaces per T.O. 2J-F100-53-1, SWP 092 16.





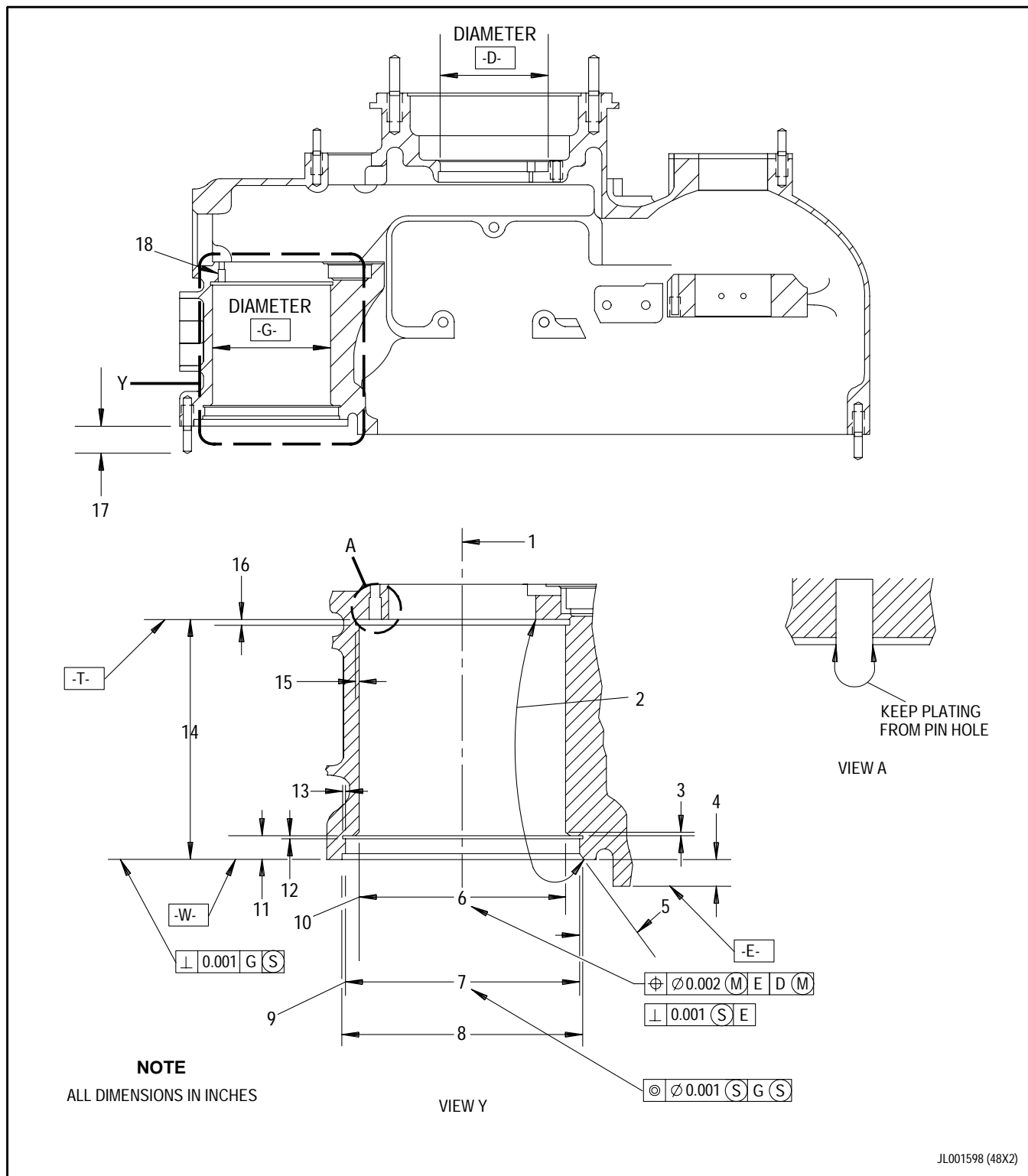
**Legend for figure 8**

1. 1.242 to 1.255 inch diameter
2. 1.223 inch diameter maximum. This diameter and(5) Diameter B aligned within 0.001 inch with this diameter and Diameter B at maximum material condition.
3. 1.2335 to 1.2345 inches
4. 3.9697 inches to centerline of Diameter D
5. 1.1013 to 1.1018 inches
6. 0.005 to 0.012 inch radius
7. 3.292 to 3.294 inches
8. 7.543 to 7.547 inches to Surface E
9. 1.237 to 1.250 inch diameter
10. 1.219 inch diameter maximum
11. 1.229 to 1.230 inch diameter
12. Chamfer 0.030 to 0.050 inch x 45° ±5°
13. 0.010 to 0.030 inch modified radius
14. 0.030 to 0.045 inch
15. 0.010 to 0.030 inch modified radius
16. 4.194 to 4.204 inches
17. 4.550 to 4.560 inches
18. 3.2605 to 3.2635 inch diameter
19. 2.969 to 2.970 inch diameter
20. This diameter at maximum material condition shall be concentric within 0.001 inch of true position in relation to diameter C at maximum material condition.
21. This surface shall be parallel with Surface E within 0.001 inch.
22. The centerline formed by Diameters B and C shall be square with Surface Y within 0.001 inch total and located within 0.001 inch total of true position in relation to Diameter D and Plane A.

**14. GEARBOX (REAR) HOUSING  
ASSEMBLY - WELD REPAIR OF LOOSE DOWEL  
PIN AT NO. 2 AND 3 BEARING SCAVENGE OIL  
PUMP MOUNT PAD.**

(See Figures 9 and 10.)

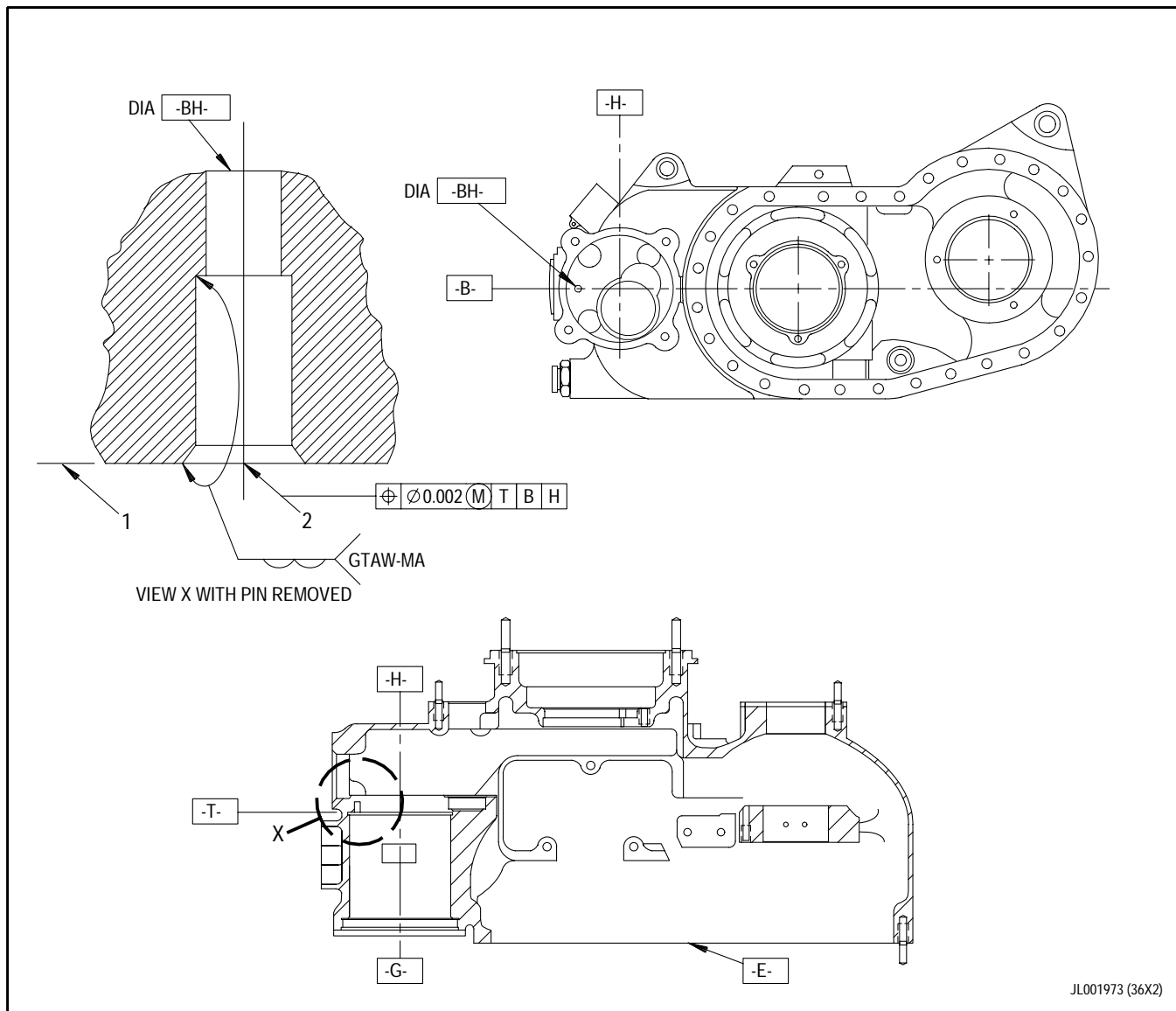
- a. Remove dowel pin(18, figure 9) by pushing on rear of pin through pilot hole.
- b. Strip hardcoat area(2) per T.O. 2-1-111, SPOP 39.
- c. Vapor degrease repair area per T.O. 2J-F100-53-1, SWP 031 02.
- d. Build up inside diameter surface of dowel pin hole with weld per PWA 16-14. (See figure 10.) Use AMS 4190 filler material, parent material is AMS 4215.
- e. Finish machine to dimension.
- f. Fluorescent penetrant inspect machined surface per T.O. 2J-F100-9. No cracks permitted.
- g. Nickel plate per SPOP 43 in T.O. 2-1-111. Plating outside of enclosed area is permissible, provided excess plate is removed. Plate thickness shall be 0.003 to 0.011 inch thick after final machining.
- h. Finish machine to dimensions (see figures 9 and 10).
- i. Permanently identify with beehive symbol in area near part number using deep etch method per T.O. 2J-F100-53-1, SWP 023 02.
- j. Install dowel pin per paragraph 3.
- k. Anodize touch-up all repaired bare metal exterior surfaces per T.O. 2J-F100-53-1, SWP 092 16.



**Figure 9. Gearbox Rear Housing Assembly - Main (Oil Scavenge)  
Pump Cavity Aluminum Hardcoating and Pin Replacement**

**Legend for figure 9**

1. 6.129 inches to center line Diameter D.
2. Strip hardcoat in included area all around. Nickel plate enclosed area. Nickel plate required on Diameters G, P and Surface T. Other areas optional and may be incomplete. Plating not permitted in oil ports.
3. Chamfer 0.030 to 0.050 inch x  $45^{\circ} \pm 5^{\circ}$
4. 0.253 to 0.257 inch reference
5.  $20^{\circ} \pm 2^{\circ}$
6. 3.2605 to 3.2635 inch Diameter G. This diameter at maximum material condition shall be located within 0.002 inch diameter in relation to Surface E and Diameter D with Diameter D at maximum material condition. The diameter regardless of feature size shall be perpendicular to Surface E within 0.001 inch diameter.
7. 3.672 to 3.673 inch Diameter P. This diameter regardless of feature size shall be concentric to Diameter G regardless of feature size within 0.001 inch diameter.
8. 3.720 to 3.740 inch diameter. This diameter regardless of feature size shall be concentric to Diameter 7, regardless of feature size within 0.010 inch diameter.
9. Clean up machine 3.679 to 3.694 inch diameter. Hold to minimum value. Nickel plate to 3.662 inch diameter maximum. Finish to Diameter P.
10. Clean up machine 3.270 to 3.282 inch diameter. Hold to minimum value. Nickel plate to 3.250 inch diameter maximum. Finish to Diameter G.
11. 0.390 to 0.410 inch
12. 0.040 to 0.060 inch
13. 0.000 to 0.010 inch
14. Clean up machine 3.805 to 3.809 inches from Surface W. Hold to minimum value. Nickel plate to 3.793 inch maximum. Finish 3.798 to 3.802 inches.
15. 0.000 to 0.010 inch
16. 0.040 to 0.060 inch
17. 0.840 to 0.860, 4 places maximum
18. Dowel pin
19. This surface shall be perpendicular to Diameter G within 0.001 inch regardless of feature size of diameter G.



**Figure 10. Gearbox Rear Housing Assembly - Weld Repair for Loose Dowel Pin at No. 2 and 3 Bearing Scavenge Oil Pump Mount Pad**

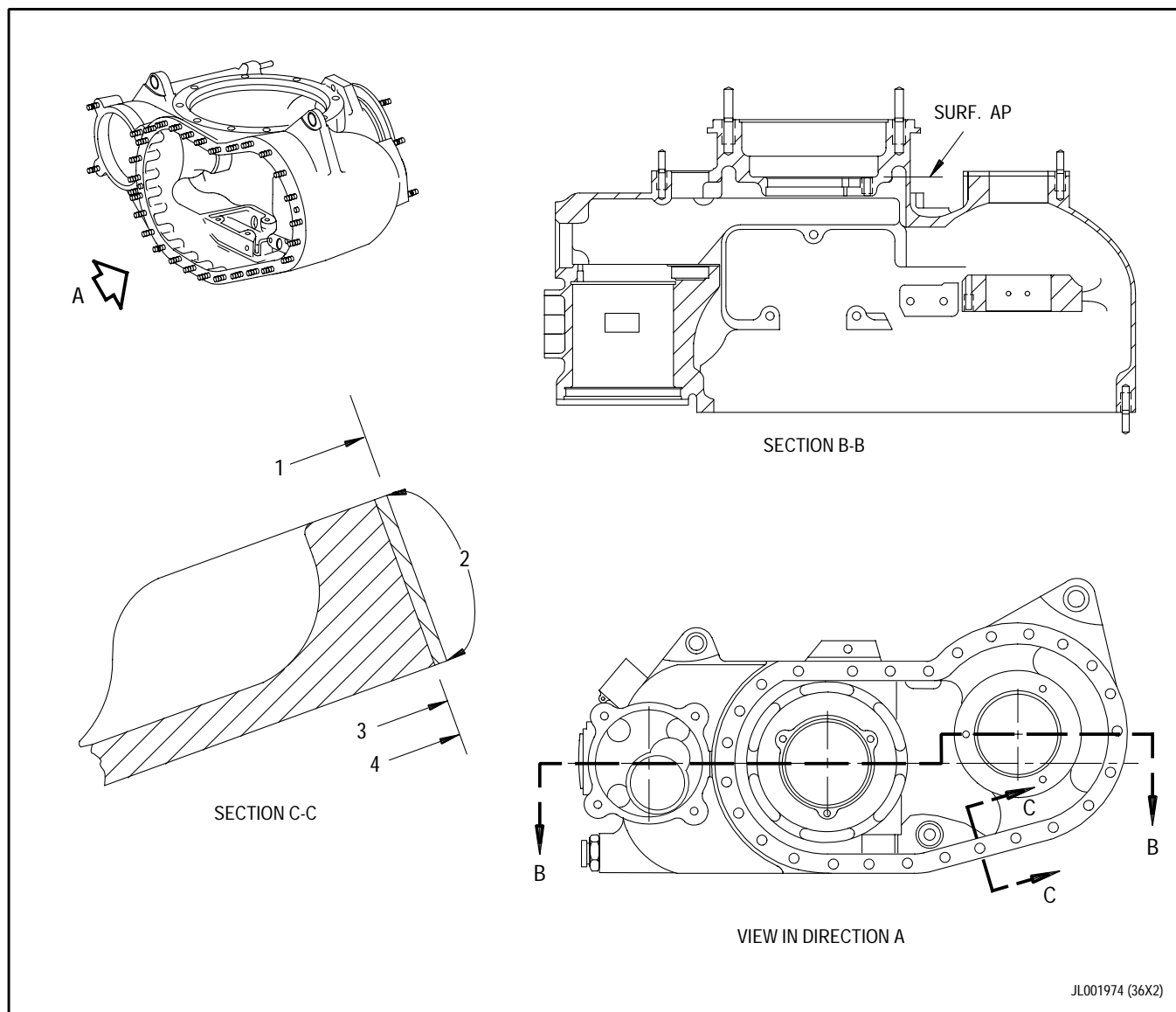
**Legend for figure 10**

1. No. weld buildup permitted beyond this surface. Finish as required.
2. After weld buildup, machine 0.186 to 0.187 inch diameter depth 0.330 to 0.360 inch. Chamber  $90^{\circ} \pm 5^{\circ}$  included angle 0.210 to 0.230 inch diameter location in relation to diameter -BH- within 0.006 inch minimum radial distance, 0.150 maximum diameter through location within diameter -BH-.

**15. GEARBOX REAR HOUSING - PLATE  
REPAIR OF FRONT COVER MOUNTING FLANGE.**

(See Figure 11.)

- a. Remove studs and dowel pins per paragraphs 2 and 3 respectively.
- b. Machine flange to dimensions shown. If machining does not clean up entire surface, discontinue this procedure.
- c. Fluorescent penetrant inspect machined surface per T.O. 2J-F100-9. No cracks allowed.
- d. Nickel plate flange per T.O. 2-1-111, SPOP 43. Do not plate into stud or dowel pin holes.
- e. Finish machine plated area to dimensions shown.
- f. Mark with beehive symbol adjacent to part number per T.O. 2J-F100-53-1, SWP 023 02.
- g. Install studs and dowel pins per paragraphs 2 and 3 respectively.



**Figure 11. Gearbox Rear Housing Assembly - Plate Repair of Front Cover Mounting Flange**



**Legend for figure 11**

1. 7.384 to 7.386 inches. Finish machined to surface AP.
2. Nickel plate per text.
3. 7.395 inches minimum to surface AP after plating.
4. 7.378 to 7.382 inches to surface AP before plating, hold to minimum value.

**16. MAIN GEARBOX HOUSING -  
IDENTIFICATION PLATE REPAIR.**

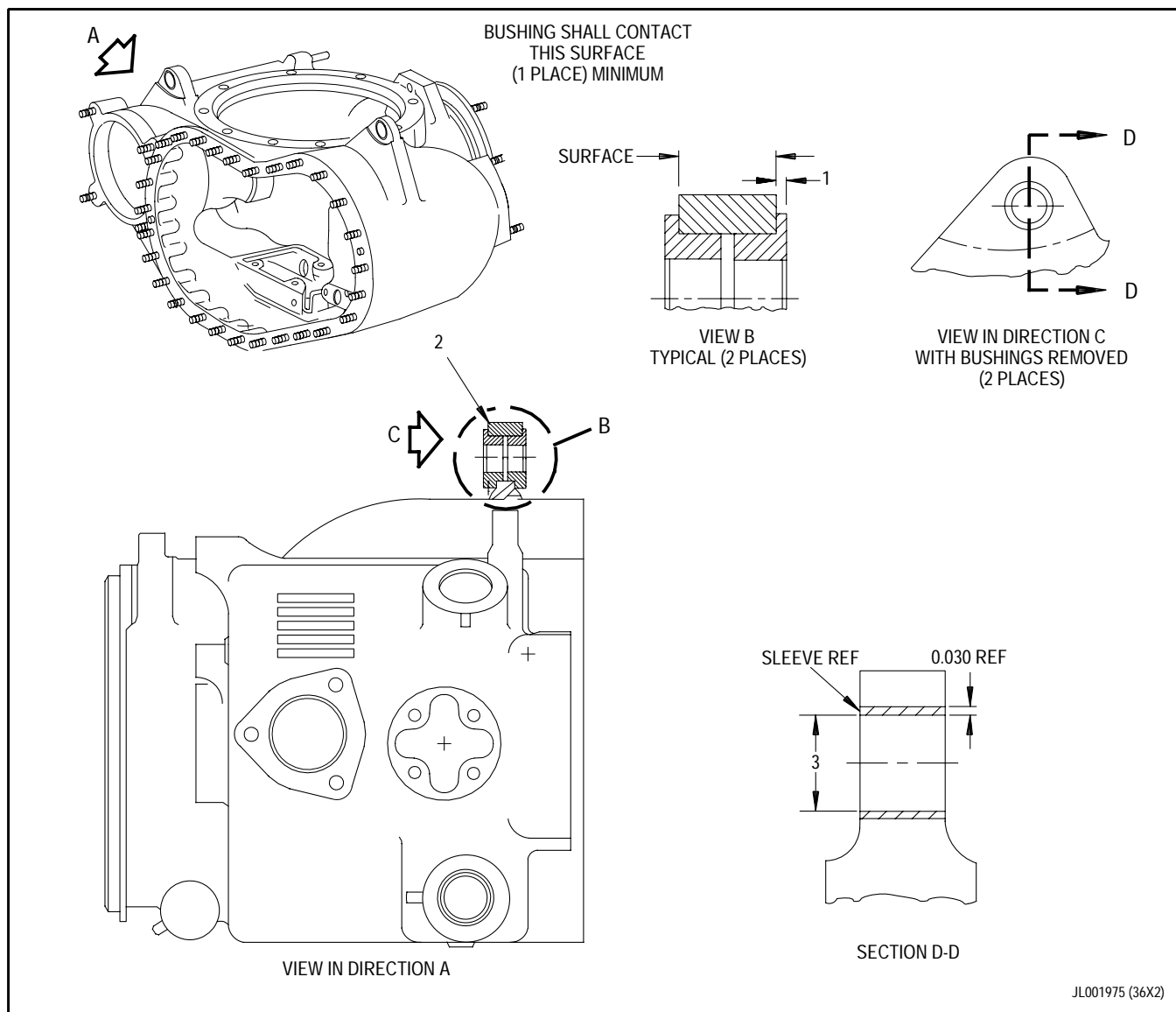
- a. Remove screws securing identification plate to gearbox housing.
- b. Clean identification plate, gearbox housing under and around plate attachment area and inside gearbox drive screw holes with methyl ethyl ketone.
- c. Apply a thin layer (approximately 0.020 inch thick) of PWA 36047 RTV sealant to back of identification plate and squeeze some sealant into four drive screw holes in gearbox housing.
- d. While adhesive is still tacky, press identification plate firmly onto gearbox and install four drive screws.
- e. Cure adhesive bond at room temperature for 5 days or heat 200° to 250°F (93.3° to 121.1°C) for 2 hours with a minimum of 10 hours at room temperature after heating.

**17. GEARBOX (REAR) HOUSING - MOUNT BUSHINGS - REPLACEMENT.**

(See Figure 12.)

- a. Inspect bushing(2, figure 12) for wear over maximum serviceable limits and make repairs as follows:
  - (1) Inspect dimension(1). If dimension(1) is under 0.060 inch, replace gearbox module and do not continue with this procedure.
  - (2) If dimension(1) measures 0.060 inch or greater, proceed to step b.
- b. Remove unserviceable bushings from gearbox mount lugs as follows:
  - (1) Install PWA 70109 puller against mount lug face.
  - (2) Adjust puller jaw to fit halfway through bushing hole (between bushing halves) to engage jaw against hidden end of bushing half.
  - (3) Install expander screw detail-3 through puller jaw and secure. Expander screw keeps jaws engaged.

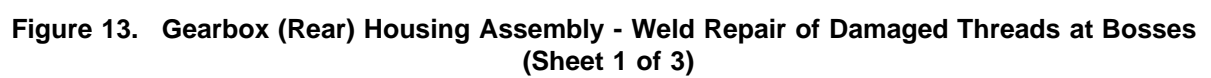
- (4) Connect PWA 55380 pump to puller and remove bushing half by applying hydraulic pressure.
- (5) Reverse puller and remove other bushing half or drift bushing half out.
- c. Inspect mount lug hole for steel sleeve dimension(3) wear limit.
- d. Install bushings in sleeved mounting lugs as follows:
  - (1) Chill bushing halves in dry ice.
  - (2) Apply wet zinc chromate primer (AMS 3110). Refer to T.O. 2-1-111, SPOT 157 to bushing halves and matching holes in gearbox. Omit bake cycle.
  - (3) Using PWA 70109 puller, install chilled bushing half on tool and remove puller jaws.
  - (4) Apply puller against lug face. Install puller knob into puller body and apply hydraulic pressure using PWA 55380 pump.







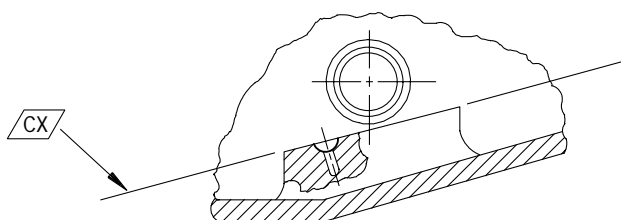
1. 0.060 inch minimum, both sides
2. Bushing
3. Sleeve ID maximum allowable is 0.618 inch (wear limit).

**Figure 12. Gearbox (Rear) Housing - Mount Bushings Replacement**

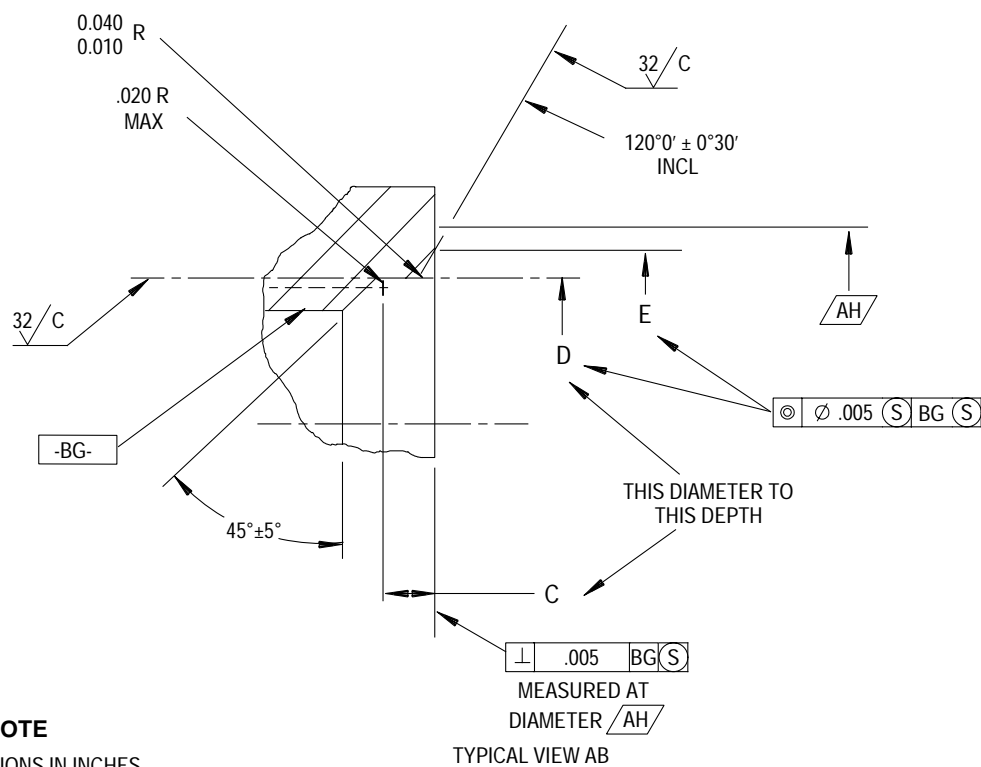
- (5) Seat bushing half until at least one point of bushing flange contacts side of gearbox lug.
  - (6) Reverse puller and seat opposite bushing half.
  - (7) Repeat step (5).
  - e. Inspect lug after bushing installation as follows:
    - (1) Insert PWA 70108 gage pin (0.3743 inch diameter) through bushing hole, two places. Gage pin shall pass through both bushings.
    - (2) If gage pin does not pass through hole, repeat steps b through e once with new bushings. If inspection still fails, replace gearbox assembly.
  - b. Weld per PWA 16-4 in T.O. 2J-F100-53-1, SWP 093 01, using AMS 4190 filler material. Parent material is AMS 4215. Build up inside diameter surface of affected boss with weld.
  - c. Stress-relieve at 340° to 360°F (171° to 182°C) for two hours.
  - d. Machine boss to dimensions shown in figure 13 as required.
  - e. All dimensions apply when Surface -E- is flat within 0.001 inch total in free state or constrained. Constraint contact allowed only on Surface -E-. In free state Surface -E- shall be flat within 0.002 inch total.
  - f. Inspect machined surface for compliance with dimensions given in step e.
  - g. Anodize touch-up repair all bare external surfaces per T.O. 2J-F100-53-1, SWP 092 16.
- 18. GEARBOX (REAR) HOUSING ASSEMBLY - WELD REPAIR OF DAMAGED THREADS AT BOSSES.** (See Figure 13.)
- a. Vapor degrease repair areas per T.O. 2J-F100-53-1, SWP 031 02 prior to welding.



SEAL AREA DIMENSIONS				
LOC	C	D DIA	E DIA	DIA 
 	.107 TO .122	.893 TO .898	1,000 TO 1,015	1.125 MIN
	.075 TO .090	.450 TO .455	.562 TO .577	.700 MIN



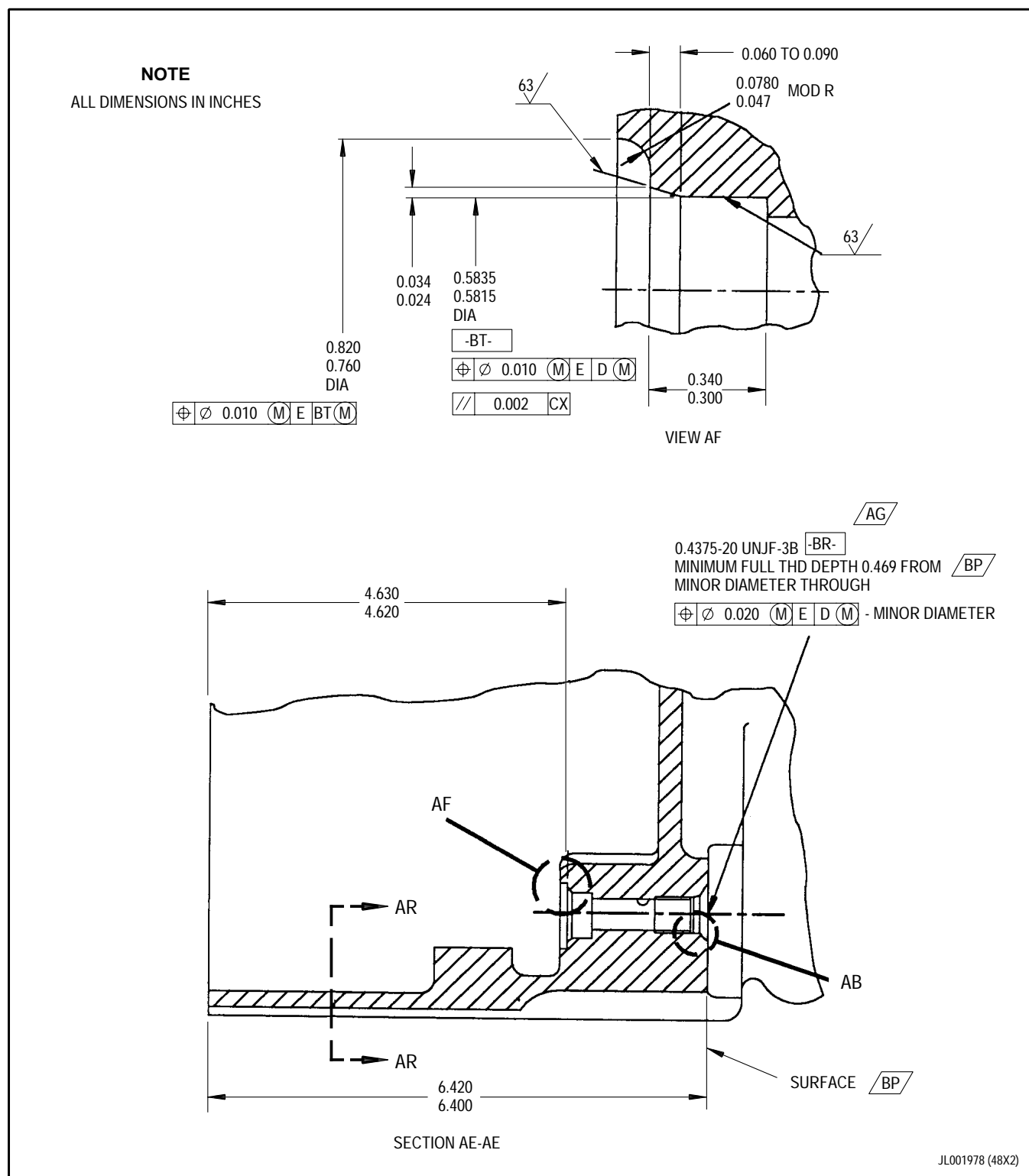
SECTION AR-AR



**NOTE**  
ALL DIMENSIONS IN INCHES

JL001977 (48X2)

**Figure 13. Gearbox (Rear) Housing Assembly - Weld Repair of Damaged Threads at Bosses  
(Sheet 2 of 3)**



**Figure 13. Gearbox (Rear) Housing Assembly - Weld Repair of Damaged Threads at Bosses  
(Sheet 3 of 3)**

**Legend for figure 13**

1. 2.285 inches
2. 0.875-14UNJF-3B through, as shown
3. 0.875-14UNJF-3B through, as shown
4. 3.000 inches
5. 0.2482 to 0.2492 inch diameter
6. 2.969 to 2.971 inch diameter
7. Diameter 6 at maximum material condition shall be located within 0.020 inch diameter of true position in relation to Diameters D and F, with Diameter F at maximum material condition.
8. Diameter 7 at maximum material condition shall be located within 0.020 inch diameter of true position in relation to Diameters D and E, with Diameter D at maximum material condition.
9. 3.005 to 3.025 inches



# WORK PACKAGE

## TECHNICAL PROCEDURES

### COVER, PACKING, GEARBOX -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0	4	Blank	0	

**T.O. 2J-F100-53-11**

**WP 403 00**

**REFERENCE MATERIAL REQUIRED**

<b>Title</b>	<b>Number</b>
Standard Maintenance Procedures - - - - -	T.O. 2-1-111
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Grinding, Blending, Lapping, Buffing, and Peening - General - - - - -	WP 091 00
Anodize Touch-up, Brush or Swab - - - - -	SWP 092 16

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

**1. INTRODUCTION.**

- a. This work package contains instructions for repair of the gearbox packing cover.

- b. Coat exposed aluminum with anodize touchup per T.O. 2J-F100-53-1, SWP 092 16.

**2. REPAIR.**

- a. Blend raised metal flush to within 0.005 inch of adjacent undisturbed surface, per T.O. 2J-F100-53-1, WP 091 00.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### SEAL ASSEMBLY, FACE - REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4					1

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Lapping of Main Bearing Carbon Seal Plates, or Spacers - - - - -	SWP 091 05
Seal Plates, or Spacers - - - - -	SWP 091 06

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

- a. This work package contains instructions for repair of the face seal assembly.

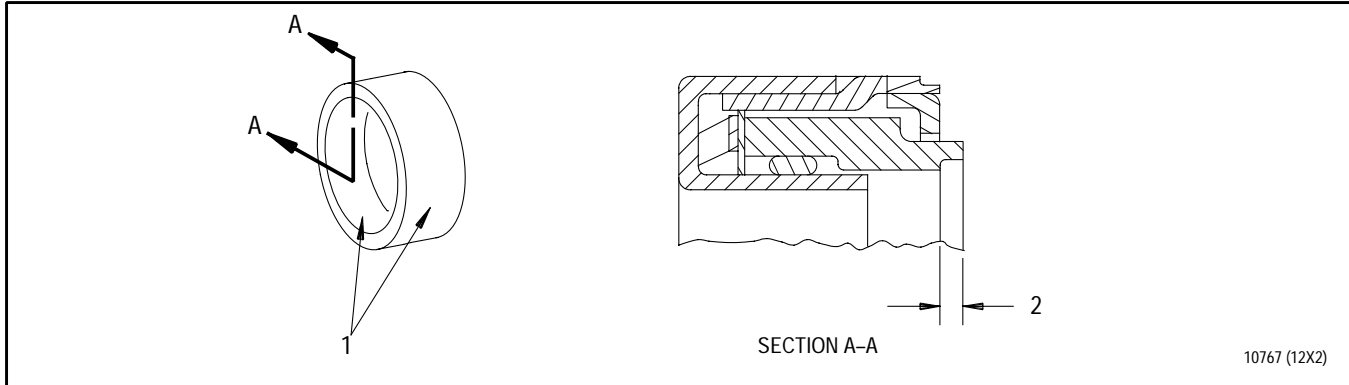
**2. FACE SEAL ASSEMBLY - LAPPING REPAIR.**

(See Figure 1.)

- a. Lap to required finish per figure 1 and T.O. 2J-F100-53-1, SWP 091 05 and SWP 091 06. Do not reduce seal lip height below minimum(2, figure 1.)

**3. NONSEALING SURFACE AREAS - REPAIR.**

- a. Hand blend with fine abrasive stone to remove nicks and raised metal.



1. Nonsealing surface areas
2. 0.025 inch minimum seal lip height

**Figure 1. Face Seal Assembly - Repair**



WP 405 00 Deleted



**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**RETAINER, OIL SEAL, GEARBOX -**

**REPAIR**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 4

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 3 . . . . .	0	4 Blank . . . . .	0		

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Grinding, Blending, Lapping, Buffing, and Peening -	WP 091 00
General - - - - -	
Anodize Touchup, Brush or Swab - - - - -	SWP 092 16

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

- a. This work package contains instructions for repair of the gearbox oil seal retainers incorporated in the reduction gearbox.

- b. Coat exposed aluminum with anodize touchup per T.O. 2J-F100-53-1, SWP 092 16.

**2. GEARBOX OIL SEAL RETAINERS - REPAIR.**

- a. Blend raised metal flush to within 0.005 inch of adjacent undisturbed surface, per T.O. 2J-F100-53-1, WP 091 00.



**WORK PACKAGE****TECHNICAL PROCEDURES****PLATE ASSEMBLY, RETAINING, GEARBOX BEARING -****REPAIR****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 4

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 3 . . . . .	0				
4 Blank . . . . .	0				

**T.O. 2J-F100-53-11**

**WP 407 00**

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

<b>Nomenclature</b>	<b>Part Number</b>	<b>Quantity</b>
Pin, straight	642107	1

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None



**1. INTRODUCTION.**

- a. This work package contains instructions for repair of the gearbox bearing retaining plate.

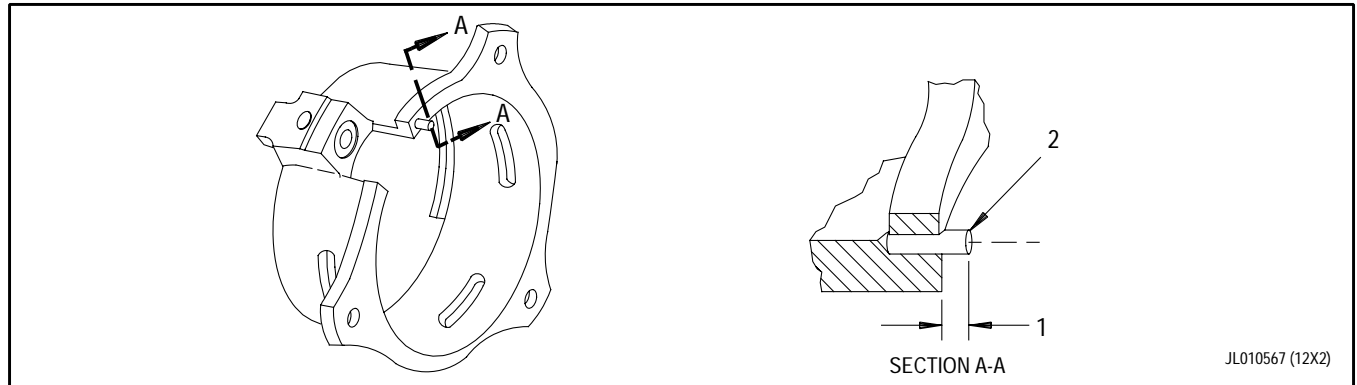
- b. Chill replacement pin(2).

- c. Using standard drift, install pin to projection length shown.

**2. REPAIR - PIN REPLACEMENT.**

(See Figure 1.)

- a. Remove unserviceable pin by drifting from inside.



1. 0.100 to 0.120 inch

2. PN 642107 headless straight pin

**Figure 1. Gearbox Bearing Retaining Plate - Pin Replacement**



# WORK PACKAGE

## TECHNICAL PROCEDURES

### BAFFLE, GEARBOX -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0	4	Blank	0	

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Grinding, Blending, Lapping, Buffing, and Peening - General - - - - -	WP 091 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

- a. This work package contains instructions for repair of the gearbox baffle.

**2. BAFFLE, GEARBOX - BLEND REPAIR.**

- a. Remove raised metal by stoning per T.O. 2J-F100-53-1, WP 091 00.

**3. BAFFLE, GEARBOX - DENT REPAIR.**

- a. Using rawhide or plastic mallet, straighten dent to conform as close as possible to original contour.
- b. Stress relieve baffle at 1175° to 1225°F (635° to 663°C) for 2 hours. Air cool.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### SEAL SEAT, (REDUCTION) GEARBOX BEARING -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4					0

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Lapping of Main Bearing Carbon Seals, Seal Plates, and Spacers - - - - -	SWP 091 05
Optical Flatness Check of Main Bearing Carbon Seals, Seal Plates, and Spacers - - - - -	SWP 091 06

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None



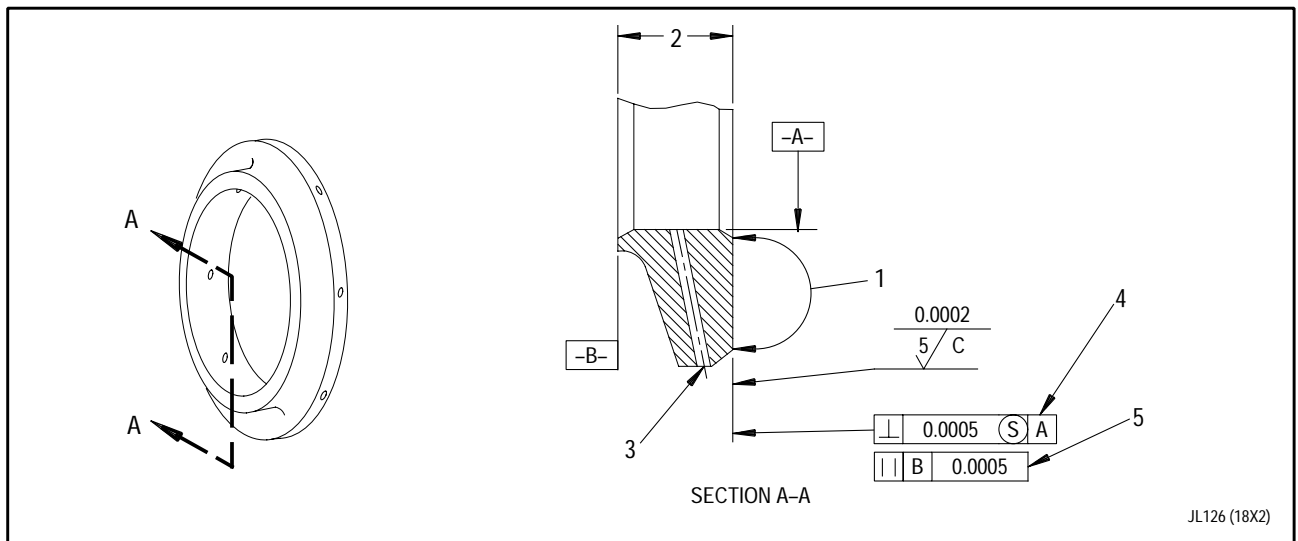
**1. INTRODUCTION.**

- a. This work package contains instructions for repair of reduction gearbox bearing seal seat.

**2. REDUCTION GEARBOX BEARING SEAL SEAT - LAPPING REPAIR.**

(See Figure 1.)

- a. Lap sealing area(1, figure 1) to required surface finish and flatness. Refer T.O. 2J-F100-53-1, SWP 091 05 and SWP 091 06.



1. Sealing surface
2. 0.520 to 0.530 inch
3. Oil hole
4. This surface shall be square with Diameter A within 0.0005 inch regardless of feature size of Diameter A.
5. This surface shall be parallel to Surface B within 0.0005 inch.

**Figure 1. Reduction Gearbox Bearing Seal Seat - Lapping Repair**

**3. NONSEALING SURFACE AREAS - REPAIR.**

- a. Deburr to remove high metal and nicks.

**4. BLOCKED OIL HOLE - REPAIR.**

(See figure 1.)

- a. Remove obstruction.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### NOZZLE, GEARBOX BEARING (REDUCTION GEARBOX)

#### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0	4	Blank	0	

**T.O. 2J-F100-53-11**

**WP 410 00**

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

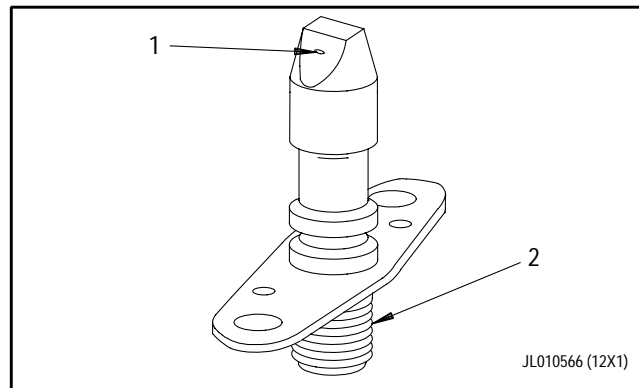
**1. INTRODUCTION.**

- a. This work package contains instructions for repairing the gearbox bearing nozzle (reduction gearbox).

**2. GEARBOX BEARING NOZZLE (REDUCTION GEARBOX) - BLOCKED OIL HOLE REPAIR.**

(See Figure 1.)

- a. Remove obstruction from blocked oil hole(1).



**Figure 1. Gearbox Bearing Nozzle (Reduction Gearbox)**

**3. GEARBOX BEARING NOZZLE (REDUCTION GEARBOX) - THREAD REPAIR.**

(See figure 1.)

- a. Repair minor thread damage(2) by filing or by using standard threading die.

- b. Replace part having excessive thread damage.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### HOUSING ASSEMBLY, GEARBOX (FRONT) -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 18

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 17 . . . . .	0				
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## REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Introduction And General Information - - - - -	T.O. 2J-F100-53-1
Anodize Touch-Up, Brush or Swab (SPOP 42) - - - - -	SWP 092 16
Plasma And Flame Spray Coating Procedures, General - - - - -	SWP 096 00
Painting, Zinc Chromate Primer (AMS 3110) (SPOP 157) - - - - -	SWP 097 10

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Powder, plasma spray	PWA 1335 or PWA 1337
Zinc chromate primer	TT-P-1757, AMS 3110

## EXPENDABLE ITEMS

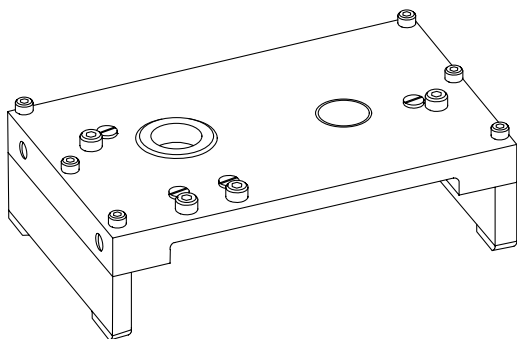
Nomenclature	Part Number	Quantity
Helical coil insert	MS124736	As required
Helical coil insert	MS124695	As required
Helical coil insert	MS124657	As required
Helical coil insert	MS124658	As required
Pin	MS9390-530 (NSN5315-01- 059-3727)	As required



## APPLICABLE SUPPORT EQUIPMENT

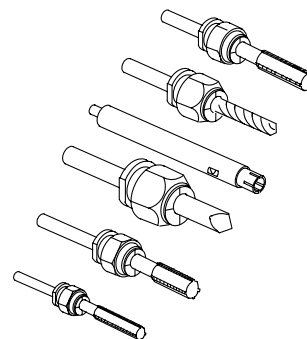
Paragraph	Function - Tool Nomenclature	Tool Number
4	Gearbox Front Housing Assembly - Dowel Pin Hole Repair	
	Fixture, Machining - - - - -	SAALC 7944916
	Tool Kit - - - - -	SAALC 8041532

## ILLUSTRATED SUPPORT EQUIPMENT



SAALC 7944916 -C

Figure T1. SAALC 7944916 Fixture



SAALC 8041532 -C

Figure T2. SAALC 8041532 Tool Kit

**1. INTRODUCTION.**

- a. This work package contains instructions for repair of gearbox (front) housing assembly.

**2. GEARBOX (FRONT) HOUSING ASSEMBLY - HELICAL COIL INSERT REPLACEMENT.**

- a. Remove damaged helical coil insert.
- b. Apply wet zinc chromate primer (AMS 3110) to a new insert and matching hole in gearbox. Refer to T.O. 2J-F100-53-1, SWP 097 10, (SPOP 157).
- c. Install new insert using proper Heli-Coil tools. Insert shall be 1.0 to 1.5 pitch below surface.
- d. Break off tang at notch.

**3. GEARBOX (FRONT) HOUSING ASSEMBLY - SNAP DIAMETER REPAIR.**

(See Figure 1.)

- a. Clean up machine to dimensions shown.
- b. Nondestructive inspect machined surfaces. Refer to T.O. 2J-F100-9.
- c. Plasma spray areas shown(1, figure 1). Refer to T.O. 2J-F100-53-1, WP 096 00.
- d. Finish machine to dimensions shown.
- e. Touch up anodize coating on nonmachined surfaces per AMS 2473. Refer to T.O. 2J-F100-53-1, SWP 092 16, (SPOP 42).

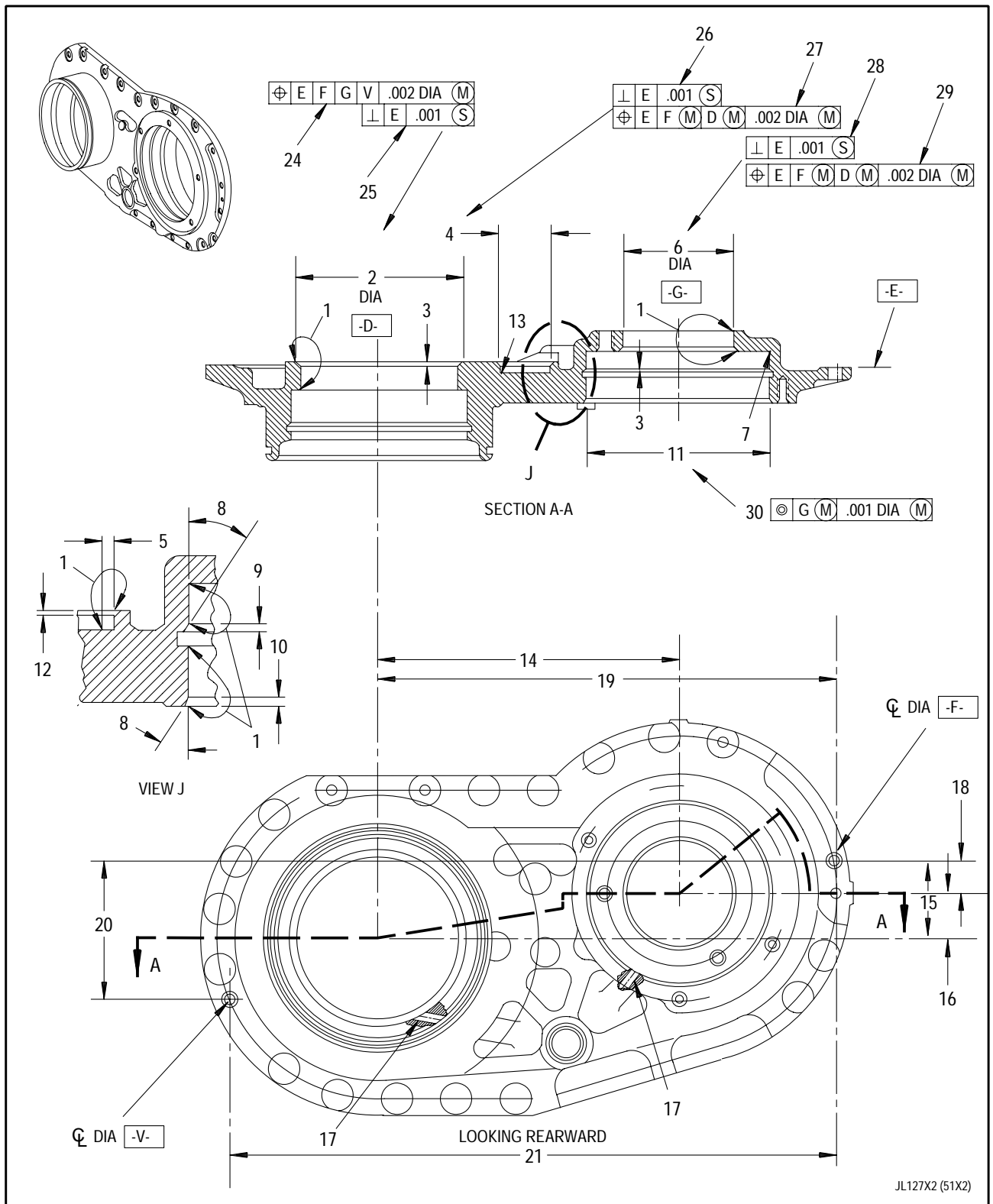


Figure 1. Gearbox (Front) Housing Assembly - Snap Diameter Repair (Sheet 1 of 2)

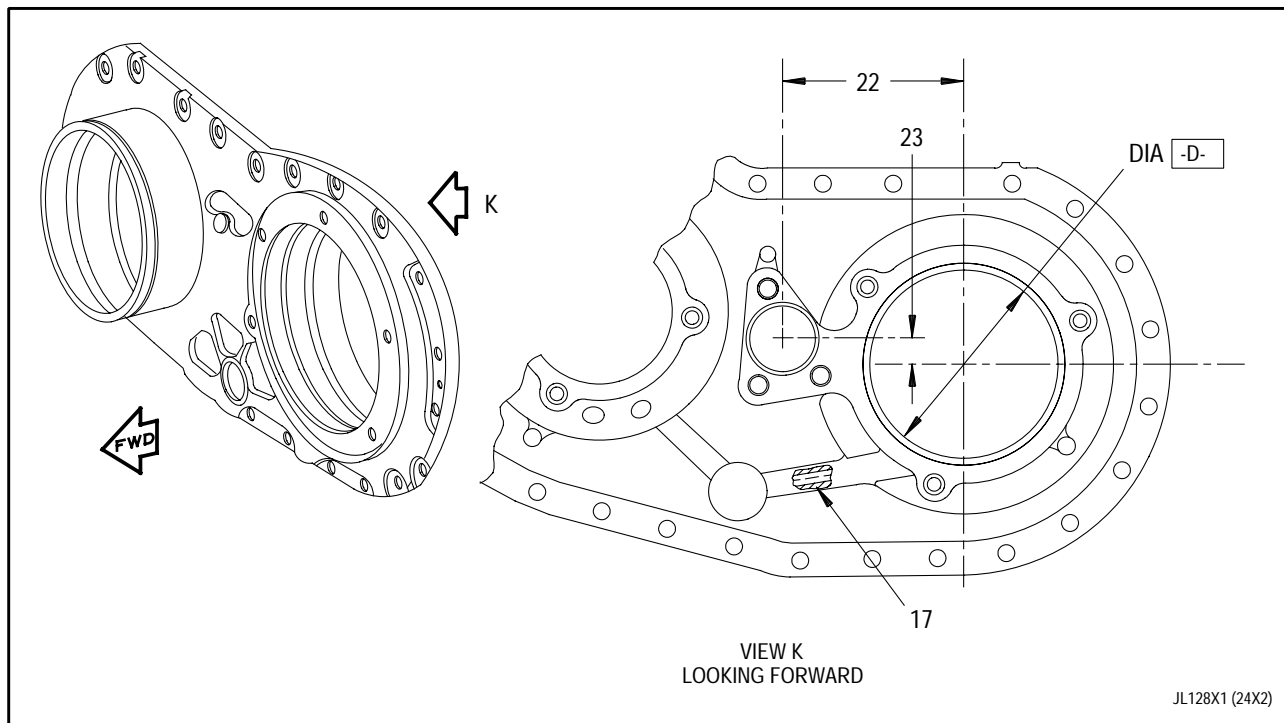


Figure 1. Gearbox (Front) Housing Assembly - Snap Diameter Repair (Sheet 2 of 2)

**Legend for figure 1**

1. Plasma spray enclosed area per PWA 53-37 (0.001 to 0.003 inch thick per side). Then apply PWA 53-35 to build up remaining thickness. Spray outside of enclosed area is permissible, but such excess spray must be removed.
2. Clean up machine 3.5505 to 3.5605 inch diameter, hold to minimum value. Plasma spray to 3.5296 inch diameter maximum. Finish machine 3.5395 to 3.5405 inch diameter.
3. Chamfer 0.060 to 0.080 inch x 45° ±2°
4. Clean up machine 1.1723 to 1.1823 inch diameter, hold to minimum value. Plasma spray to 1.1513 inch diameter maximum. Finish machine 1.1613 to 1.1623 inch diameter.
5. 0.062 to 0.077 inch
6. Clean up machine 2.4479 to 2.4579 inch diameter, hold to minimum value. Plasma spray to 2.4269 inch diameter maximum. Finish machine 2.4369 to 2.4379 inch diameter
7. 0.005 to 0.020 inch modified radius
8. 30° ±2°
9. 0.045 to 0.065 inch
10. 0.065 to 0.075 inch
11. Clean up machine 4.1355 to 4.1455 inch diameter, hold to minimum value. Plasma spray to 4.1145 inch diameter maximum. Finish machine to 4.1245 to 4.1255 inch diameter.
12. Chamfer 0.020 to 0.030 inch x 45° ±5°
13. 0.031 to 0.062 inch radius
14. 6.565 inches
15. 1.670 inches
16. 0.950 inch, basic
17. No spray permitted in cored passage
18. 0.720 inch
19. 9.960 inches
20. 3.010 inches
21. 13.195 inches
22. 3.233 inches, basic
23. 0.468 inch
24. Diameter D at maximum material condition, shall be located within 0.002 inch diameter of true position in relation to Surface E, and Diameters G, F, and V.
25. Diameter D, regardless of feature size, shall be perpendicular to Surface E within 0.001 inch.
26. This diameter, regardless of feature size, shall be perpendicular to Surface E within 0.001 inch.
27. This diameter, at maximum material condition, shall be located within 0.002 inch diameter of true position in relation to Surface E and Diameters F and D, with both diameters at maximum material condition.

**Legend for figure 1 (continued)**

- 28. Diameter G, regardless of feature size, shall be perpendicular to Surface E within 0.001 inch.
- 29. Diameter G shall be located within 0.002 inch diameter of true position in relation to Surface E, and Diameters D and F, with all diameters at maximum material condition.
- 30. This diameter shall be concentric with Diameter G within 0.002 inch diameter of true position with both diameters at maximum material condition.

**4. GEARBOX (FRONT) HOUSING ASSEMBLY -  
DOWEL PIN HOLES REPAIR.**

(See Figure 2.)

- a. Refer to figure 2, Sheet 1, to determine section of hole(s) repair.
  - (1) See Sheets 1 and 2 for repair of dowel hole at Section B-B only.
  - (2) See Sheets 1 and 3 for repair of dowel hole at Section C-C only.
  - (3) See Sheets 1 and 4 for repair of dowel hole at both Section B-B and Section C-C.
- b. Use SAALC 8041532 tool kit for dowel pin hole repair as follows:

**NOTE**

All depths not specified by dimension are to be obtained by operator prior to machining. Chuck and collet details of SAALC 8041532 tool kit are to be adjusted accordingly.

- (1) Load housing into SAALC 7944916 machining fixture as follows:
  - (a) Invert SAALC 7944916 fixture on table and remove detail-3 screws four places.

- (b) Wipe clean all locating diameters and surfaces.
- (c) Install housing onto fixture, engaging round locator detail-4 and relieved locator detail-5.
- (d) With a rawhide or phenolic mallet, tap engine part to make sure contact between housing and fixture has been obtained.
- (e) Install screws detail-3 four places and tighten. Do not overtighten.
- (f) Turn fixture over onto feet provided and position onto machine table.

- (2) Install detail-53 bushing and drill through dowel pin holes two places using a standard 0.250 inch diameter drill.
- (3) Remove detail-53 bushing and install detail-11 bushing.
- (4) Drill a 0.3020 inch diameter hole to depth two places, using detail-7 drill.
- (5) Remove detail-11 bushing and install detail-10 bushing.
- (6) Ream diameter to 0.3105 inch to depth two places using detail-8 reamer.
- (7) Remove detail-10 bushing.
- (8) Install PN MS9390-530 dowel pin two places using detail-1 handle and detail-2 drive pin.
- (9) Install detail-15 bushing.
- (10) Machine 0.3594 inch diameter to depth two places using detail-9 reamer.
- (11) Remove detail-15 bushing and install detail-14 bushing.
- (12) Drill a 0.190 inch diameter through hole two places, using a standard 0.190 inch diameter drill.
- (13) Remove detail-14 bushing and install detail-12 bushing.
- (14) Drill a 0.242 inch diameter hole to depth two places, using detail-10 drill.
- (15) Remove detail-12 bushing and install detail-8 bushing.
- (16) Ream diameter to 0.2510 inch two places using detail-53 reamer.
- (17) Remove detail-8 bushing and machine 90 degrees chamfer two places to depth through bushing pilot of SAALC 7944916 fixture using detail-14 chamfer drill.

## **T.O. 2J-F100-53-11**

### **WP 412 00**

- c. Machine oversize or distorted hole(s) to requirement of (13, 24, 35, or 39) as required. All evidence of wear shall be removed.
- d. Anodize machined diameters. Refer to T.O. 2J-F100-53-1, SWP 092 16, (SPOP 42).

#### **NOTE**

AMS 5732 material may be machined for use in place of PN MS9390-530 pin.

- e. Install PN MS9390-530 pin(s) in machined hole(s).
- f. Finish machine installed pin(s) to proper dowel pin hole dimensions(9, 20, 31, and 40).

- g. Anodize recesses as shown. Refer to T.O. 2J-F100-53-1, SWP 092 16, (SPOP 42).

### **5. GEARBOX (FRONT) HOUSING ASSEMBLY - SURFACE AREA BLEND REPAIR.**

- a. Blend out raised metal, removing minimum material.
- b. Polish to smoothness of original finish.
- c. Anodize touch-up repair all bared surfaces. Refer to T.O. 2J-F100-53-1, SWP 092 16, (SPOP 42).



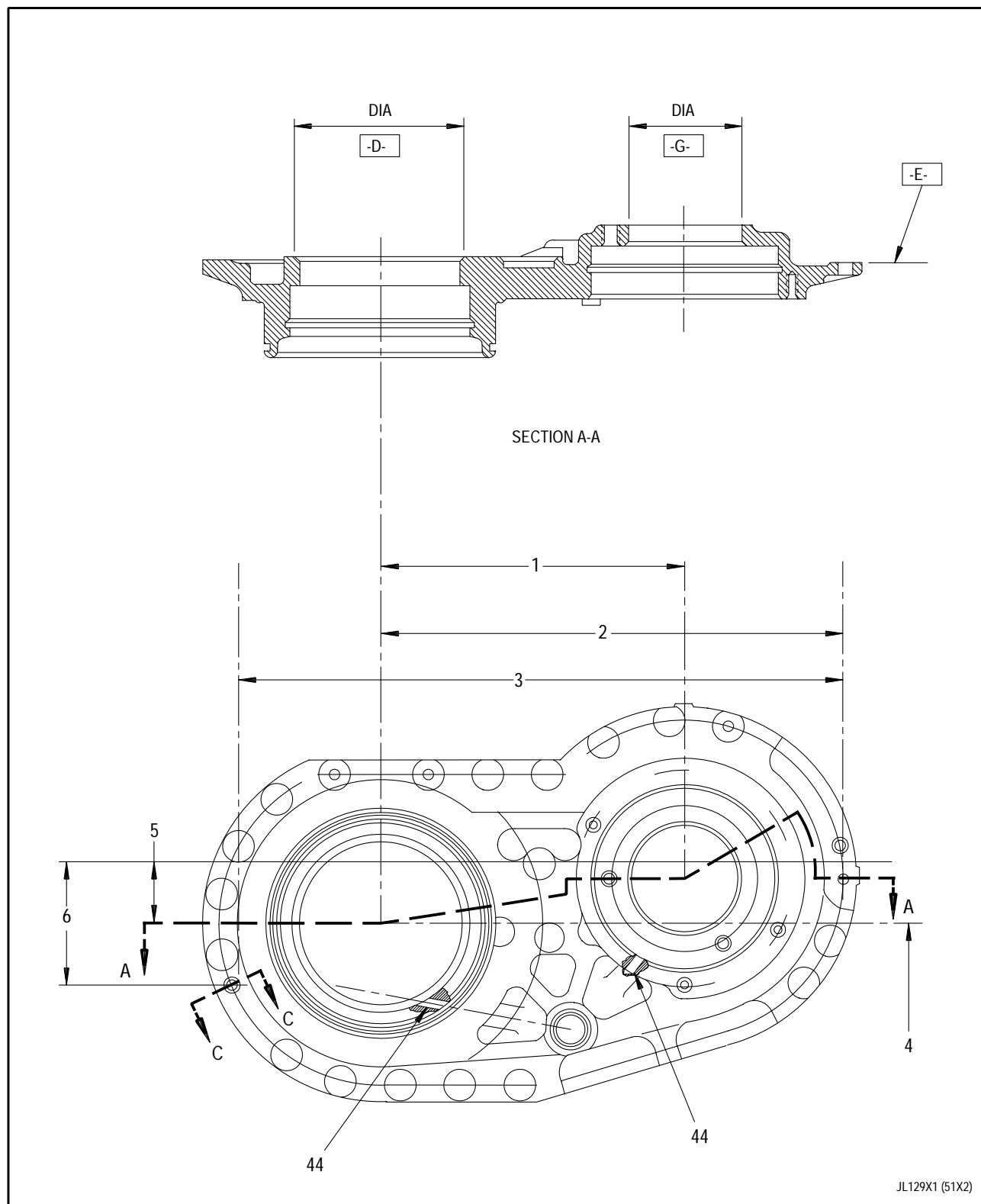


Figure 2. Gearbox (Front) Housing Assembly - Dowel Pin Holes Repair (Sheet 1 of 4)

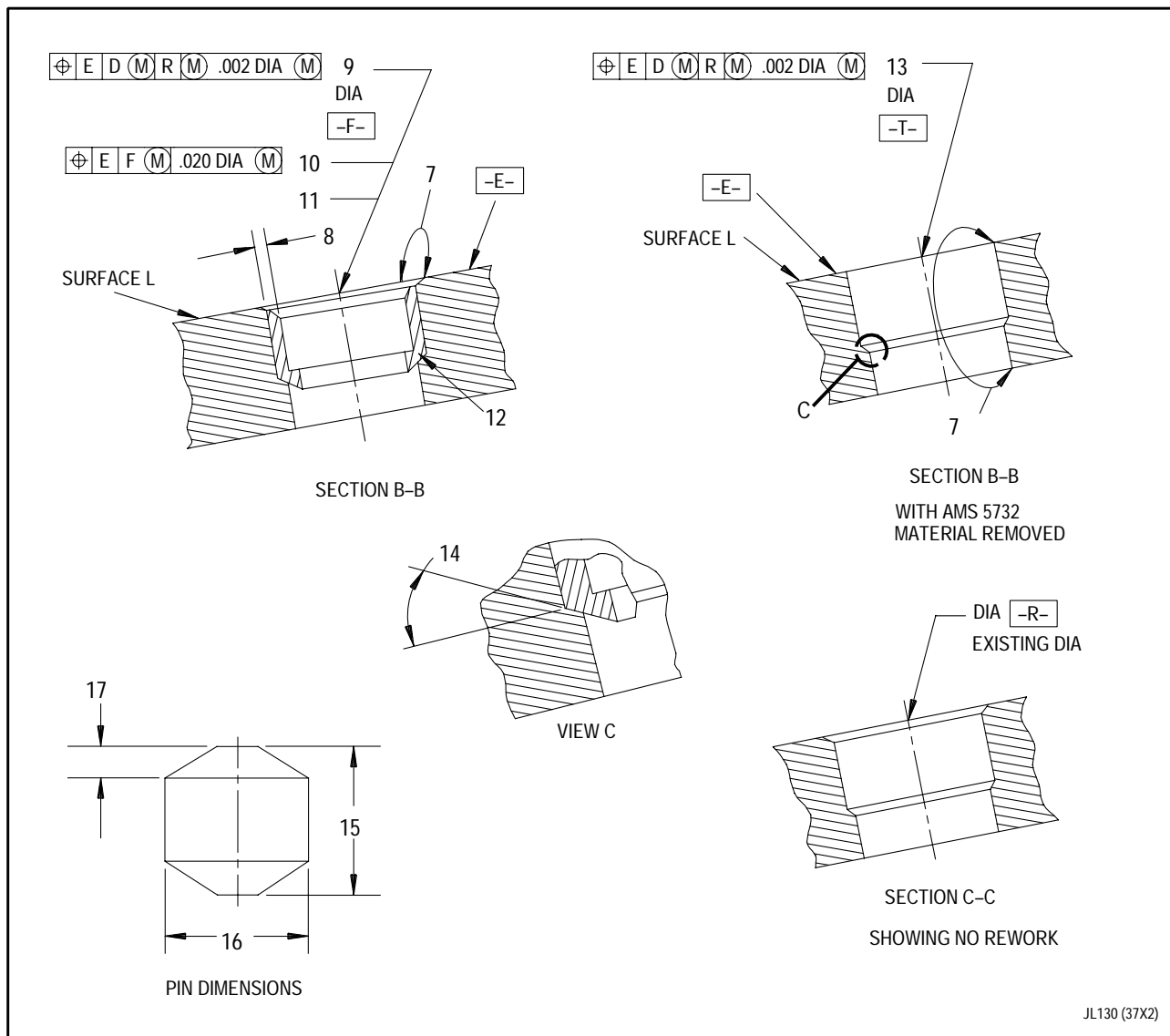


Figure 2. Gearbox (Front) Housing Assembly - Dowel Pin Holes Repair (Sheet 2 of 4)

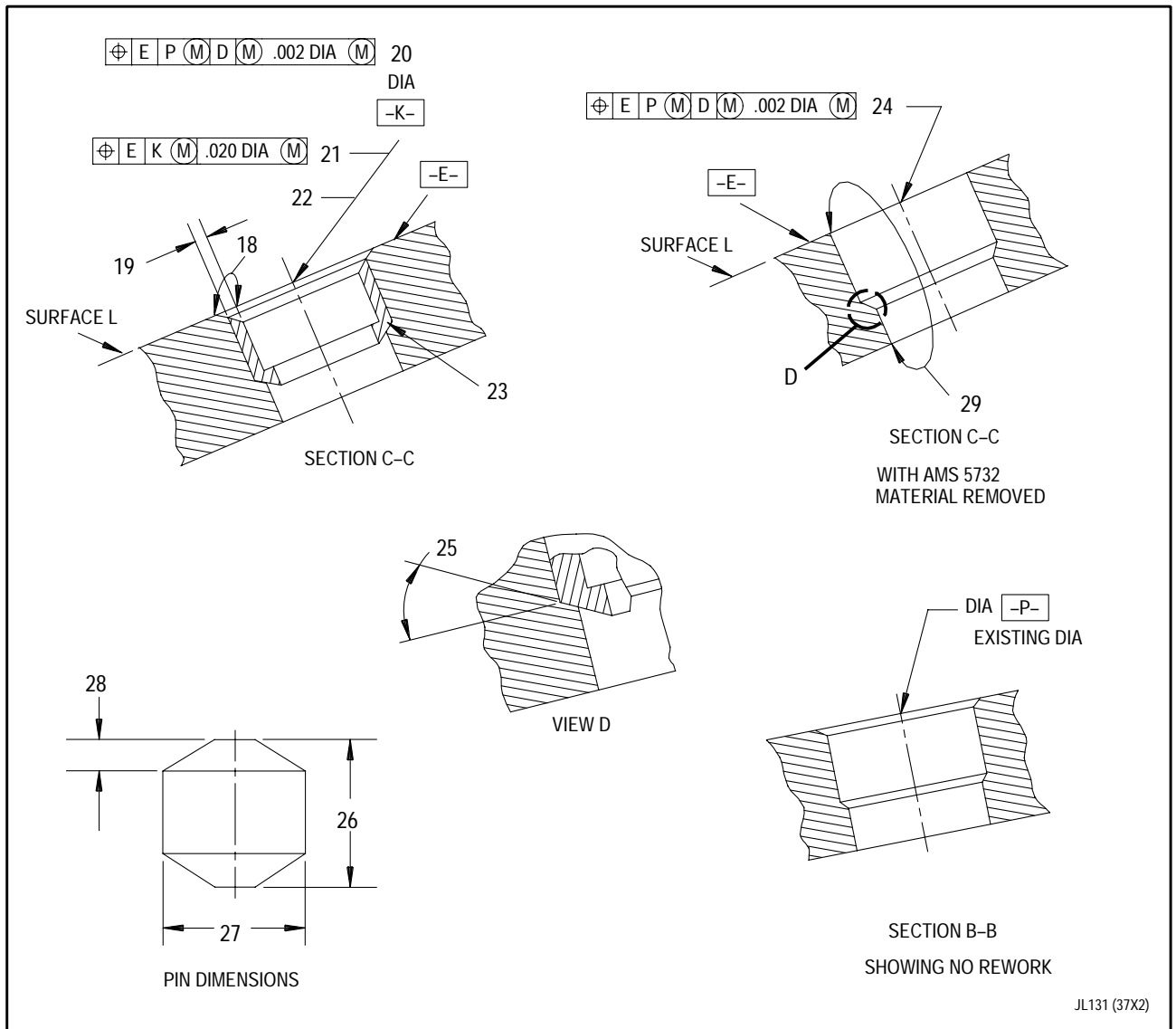


Figure 2. Gearbox (Front) Housing Assembly - Dowel Pin Holes Repair (Sheet 3 of 4)

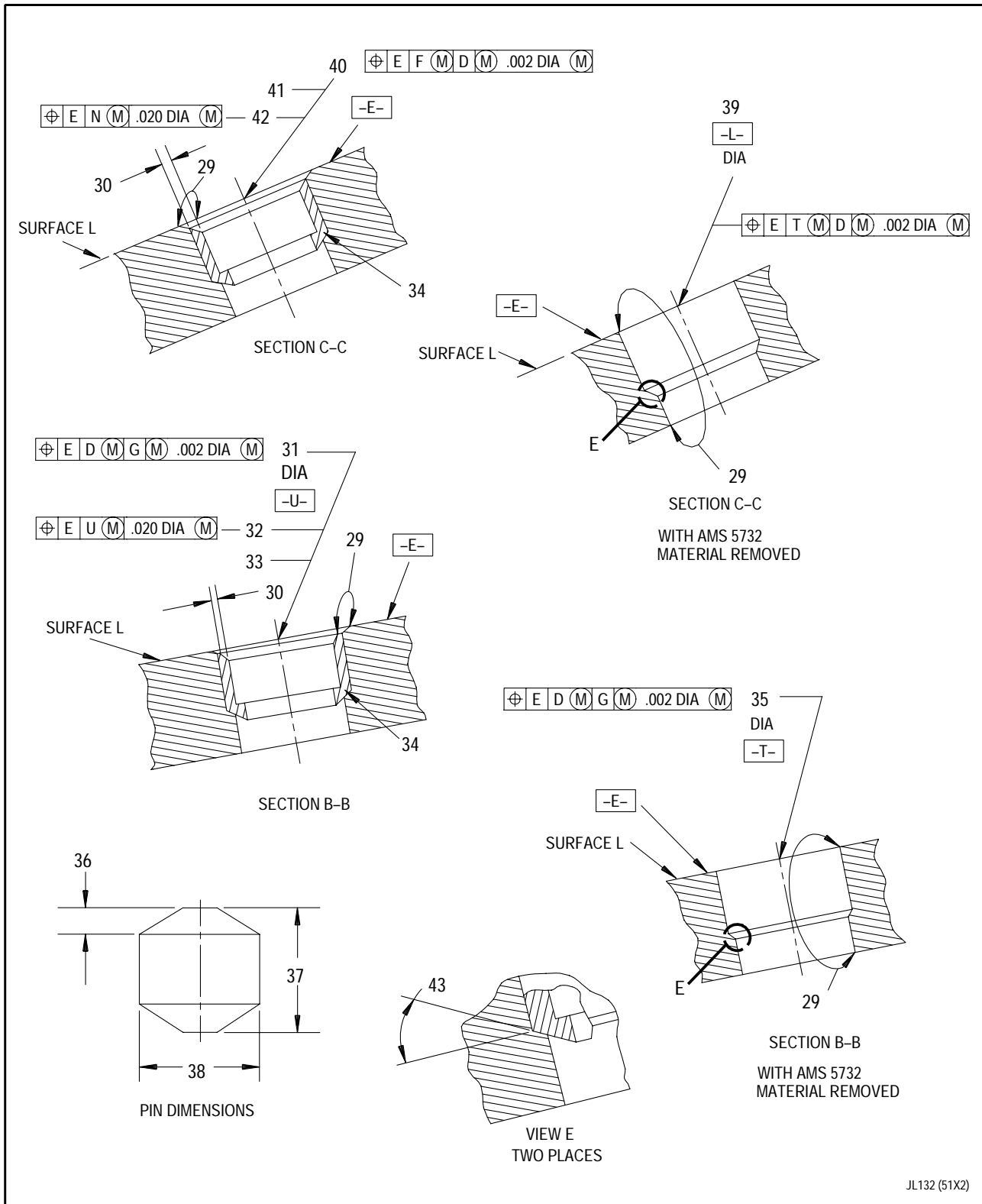


Figure 2. Gearbox (Front) Housing Assembly - Dowel Pin Holes Repair (Sheet 4 of 4)

**Legend for figure 2****NOTE**

In free state, Surface L shall be flat within 0.004 inch total. All dimensions apply when Surface L is flat within 0.001 inch total in free state or constrained. Constraint contact allowed only on Surface L.

1. 6.565 inches
2. 9.960 inches
3. 13.195 inches
4. 0.950 inch
5. 1.670 inches
6. 3.010 inches
7. Anodize this area
8. 0.004 inch minimum
9. 0.251 to 0.252 inch diameter, 0.135 to 0.155 inch depth. Diameter F, at maximum material condition, shall be located within 0.002 inch diameter of true position in relation to Surface E and Diameters D and R, with both diameters at maximum material condition.
10. 0.355 to 0.365 inch diameter, recess 0.000 to 0.005 inch depth. 0.020 inch maximum corner modified radius. Diameter F, at maximum material condition, shall be located within 0.020 inch diameter of true position in relation to Surface E and Diameter F, with Diameter F at maximum material condition.
11. Chamfer 90° ±5° inclusive 0.270 to 0.290 inch diameter as shown. 0.210 inch maximum diameter through, located within diameter(9).
12. AMS 5732 steel or reworked PN MS9390-530 pin
13. 0.3107 to 0.3117 inch diameter, 0.160 to 0.170 inch depth. 0.270 inch maximum diameter through located within diameter(13). Diameter T, at maximum material condition, shall be located within 0.002 inch diameter of true position in relation to Surface E and Diameters D and R, with both diameters at maximum material condition.
14. 30° ±5°
15. 0.300 inch minimum
16. 0.3123 to 0.3127 inch diameter
17. Chamfer 0.060 to 0.070 inch x 30° ±5° both ends
18. Anodize this area
19. 0.004 inch minimum
20. 0.251 to 0.252 inch diameter, 0.135 to 0.155 inch depth. Diameter K, at maximum material condition, shall be located within 0.002 inch diameter of true position in relation to Surface E and Diameters D and P, with both diameters at maximum material condition.

**Legend for figure 2 (continued)**

21. 0.355 to 0.365 inch diameter, recess 0.000 to 0.005 inch depth. 0.020 inch maximum corner modified radius. This diameter, at maximum material condition, shall be located within 0.020 inch diameter of true position in relation to Surface E and Diameter K, with Diameter K at maximum material condition.
22. Chamfer  $90^{\circ} \pm 5^{\circ}$  inclusive 0.270 to 0.290 inch diameter as shown. 0.210 inch maximum diameter through, located within diameter(20).
23. AMS 5732 steel or reworked PN MS9390-530 pin
24. 0.3107 to 0.3117 inch diameter, 0.160 to 0.170 inch depth. 0.270 inch maximum diameter through, located within 0.3107 to 0.3117 inch diameter. This diameter, at maximum material condition, shall be located within 0.002 inch diameter of true position in relation to Surface E and Diameters D and P, with both diameters at maximum material condition.
25.  $30^{\circ} \pm 5^{\circ}$
26. 0.300 inch minimum
27. 0.3123 to 0.3127 inch diameter
28. Chamfer 0.060 to 0.070 inch x  $30^{\circ} \pm 5^{\circ}$
29. Anodize this area
30. 0.004 inch minimum
31. 0.251 to 0.252 inch diameter, 0.135 to 0.155 inch depth. Diameter U, at maximum material condition, shall be located within 0.002 inch diameter of true position in relation to Surface E and Diameters D and G, with both diameters at maximum material condition.
32. 0.355 to 0.365 inch diameter, recess 0.000 to 0.005 inch depth. 0.020 inch maximum modified corner radius. This diameter, at maximum material condition, shall be located within 0.020 inch diameter of true position in relation to Surface E and Diameter F, with Diameter F at maximum material condition.
33. Chamfer  $90^{\circ} \pm 5^{\circ}$  inclusive 0.270 to 0.290 inch diameter as shown. 0.210 inch maximum diameter located within diameter(31).
34. AMS 5732 steel or reworked MS9390-530 pin

**Legend for figure 2 (continued)**

35. 0.3107 to 0.3117 inch diameter, 0.160 to 0.170 inch depth. 0.270 inch maximum diameter through, located within 0.3107 to 0.3117 inch diameter. Diameter T, at maximum material condition, shall be located within 0.002 inch diameter of true position in relation to Surface E and Diameters D and G, with both diameters at maximum material condition.
36. Chamfer 0.060 to 0.070 inch x 30° ±5°
37. 0.300 inch minimum
38. 0.3123 to 0.3127 inch diameter
39. 0.3107 to 0.3117 inch diameter, 0.160 to 0.170 inch depth. 0.270 inch maximum diameter through, located within 0.3107 to 0.3117 inch diameter. Diameter L, at maximum material condition, shall be located within 0.002 inch diameter of true position in relation to Surface E and Diameters D and T, with both diameters at maximum material condition.
40. 0.251 to 0.252 inch diameter, 0.135 to 0.155 inch depth. This diameter, at maximum material condition, shall be located within 0.002 inch diameter of true position in relation to Surface E and Diameters D and F, with both diameters at maximum material condition.
41. Chamfer 90° ±5° inclusive 0.270 to 0.290 inch diameter as shown. 0.210 inch maximum diameter through, located within diameter(40).
42. 0.355 to 0.365 inch diameter, recess 0.000 to 0.005 inch depth. 0.020 inch maximum modified corner radius. This diameter, at maximum material condition, shall be located within 0.020 inch diameter of true position in relation to Surface E and Diameter N, with Diameter N at maximum material condition.
43. 30° ±5°
44. No spray permitted in cored passage





**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**GEARSHAFT, SPUR, GEARBOX -**

**REPAIR**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 6

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 5 . . . . .	0	6 Blank . . . . .	0		

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Peening, Glass Bead (SPOP 500) - - - - -	SWP 091 07
Plating, Chromium, on Steel, Nickel, or Cobalt (SPOP 22) - - - - -	SWP 092 06
Plating, Silver on Steel (Not Stainless) (SPOP 23) - - - - -	SWP 092 07

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

- a. This work package contains instructions for repairing gearbox spur gearshaft.

- b. Break all sharp edges.

- c. Silver flash procedure for repair of small gear (23 teeth) only. (see figure 1.)

**2. GEARBOX SPUR GEARSHAFT - GEARTEETH REPAIR.**

(See Figure 1.)

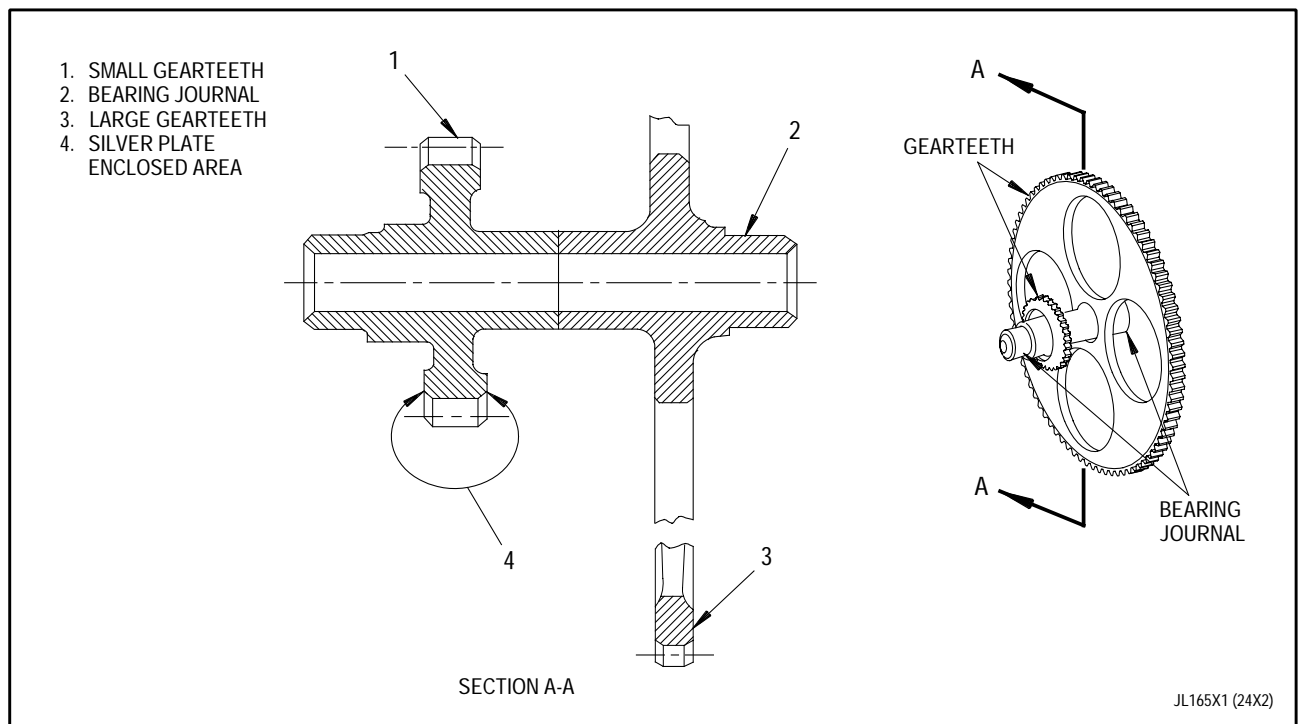


Do not attempt to remove entire damage. Do not polish repaired area.

- a. Repair minor surface damage by stoning high spots.

- (1) Glass bead peen gearteeth to an intensity of 10N. Refer to T.O. 2J-F100-53-1, WP 091 07, (SPOP 500).

- (2) Silver flash gearteeth. Refer to T.O. 2J-F100-53-1, WP 092 07, (SPOP 23), except no baking required.



**Figure 1. Gearbox Spur Gearshaft - Gearteeth Repair**

**3. GEARBOX SPUR GEARSHAFT - BEARING AND JOURNAL REPAIR.**

(See Figure 2.)

**NOTE**

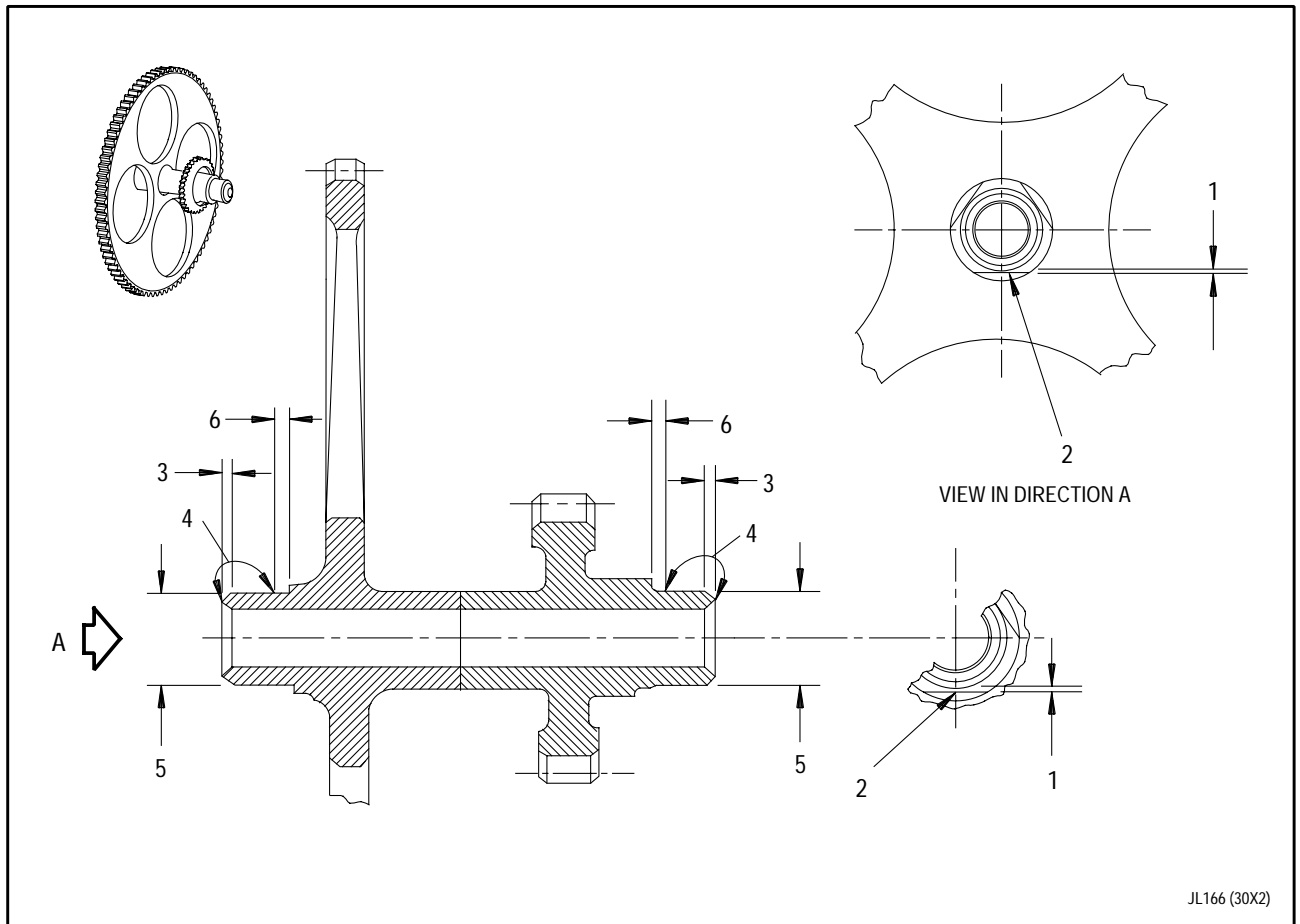
Before finish machining, 0.010 inch maximum bearing journal chromium plating thickness is allowed. After machining, 0.0025 inch minimum and 0.0075 inch maximum chromium plate thickness shall remain on journal surface. Machine only to clean up galling, scratches, or previous plating. (Example: bearing journal requirement is 0.4725 to 0.4729 inch diameter; journal clean up machining is 0.4579 to 0.4675 inch diameter; plating is 0.020 inch (0.010 inch on a side) maximum over cleaned up diameter.

- a. Machine bearing journals to dimensions shown to clean up galling, scratches, and previous plate. Remove only material required to eliminate surface damage or previous plating.

- b. Mask areas not to be plated.
- c. Chromium plate to 0.020 inch (0.010 inch on a side) maximum over actual cleaned up diameter. Refer to T.O. 2J-F100-53-1, WP 092 06, (SPOP 22).
- d. Finish machine to dimensions shown.

**4. GEARBOX SPUR GEARSHAFT - REPAIR OF OTHER AREAS.**

- a. Remove high spots from nicks, scratches, or gouges.
- b. Polish to smoothness of original finish.



1. 0.000 to 0.010 inch
2. 3 flats, equally spaced and located within 0.020 inch either side of true position.
3. Chamfer 0.020 to 0.030 inch X approximately 45 degrees.
4. Chromium plate area
5. Clean up machine 0.4579 to 0.4675 inch diameter, hold to maximum. Final machine 0.4725 to 0.4729 inch diameter. Circular runout of this diameter shall be within 0.0005 inch FIR when mounted on diameter 6 (each end of gearshaft).
6. 0.005 to 0.012 inch radius

#### NOTE

Part is made of AMS 6265 steel and has Rockwell hardness of A81-85 or equivalent.

**Figure 2. Gearbox Spur Gearshaft - Bearing and Journal Repair**



# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARSHAFT, BEVEL, SPUR, GEARBOX DRIVE -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 13 . . . . .	0				
14 Blank . . . . .	0				

**REFERENCE MATERIAL REQUIRED**

<b>Title</b>	<b>Number</b>
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Marking, Electrochemical (SPOP 401) - - - - -	SWP 023 02
Grinding, Blending, Lapping, Buffing, and Peening - - - -	WP 091 00
Peening, Steel Shot (SPOP 501) - - - - -	SWP 091 08
Plating, Chromium, on Steel, Nickel, or Cobalt (SPOP 22) - - - - -	SWP 092 06
Plating, Nickel, on Steel (Not Stainless) (SPOP 29) - - -	SWP 092 11

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

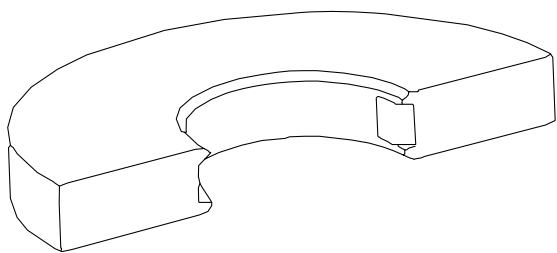
None

**APPLICABLE SUPPORT EQUIPMENT**

<b>Paragraph</b>	<b>Function - Tool Nomenclature</b>	<b>Tool Number</b>
5	Gearbox (PTO) Drive Spur Bevel Gearshaft - Spline Repair	
	Bearing, PTO gearshaft, balance	PWA 50674
	Bearing, PTO gearshaft, balance	PWA 50675
	Weight, PTO gearshaft, calibration	PWA 50676
	Weight, PTO gearshaft, calibration	PWA 50677

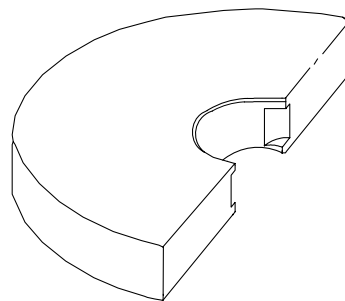


ILLUSTRATED SUPPORT EQUIPMENT



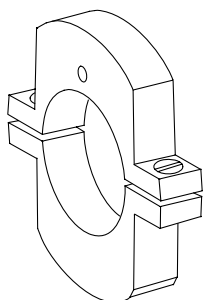
PWA 50674 -C

**Figure T1. PWA 50674 Bearing**



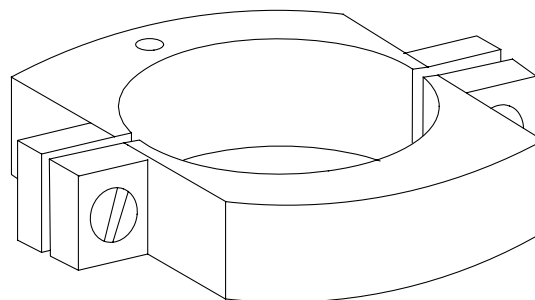
PWA 50675 -C

**Figure T2. PWA 50675 Bearing**



PWA 50676 -C

**Figure T3. PWA 50676 Weight**



PWA 50677 -C

**Figure T4. PWA 50677 Weight**

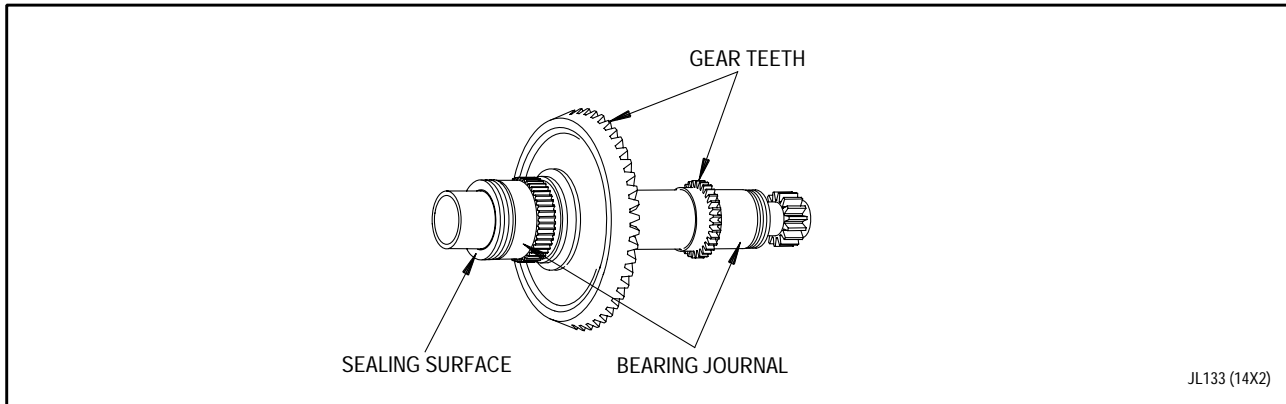
**1. INTRODUCTION.**

- a. This work package contains instructions for repairing gearbox drive spur bevel gearshaft.

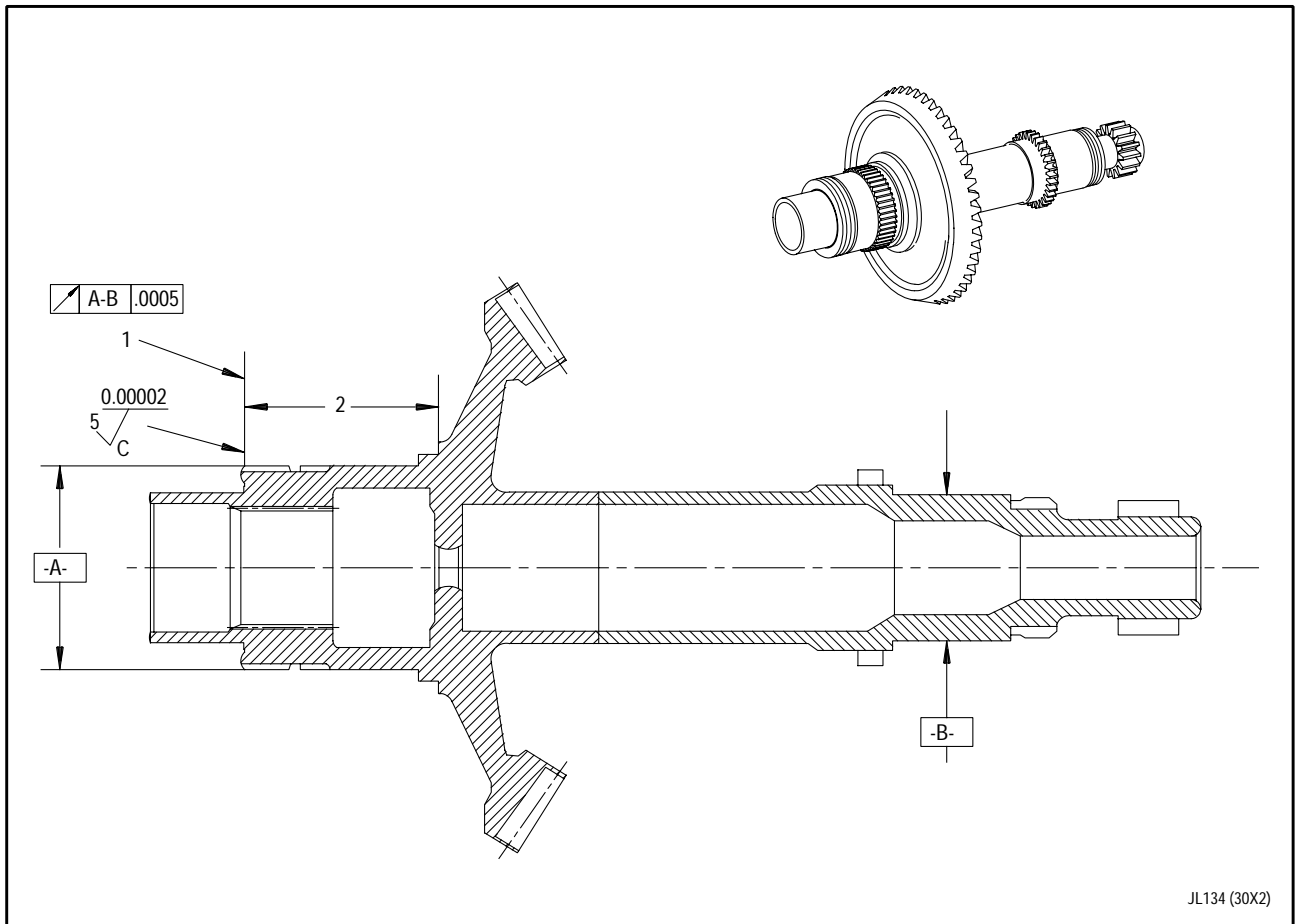
**2. GEARBOX DRIVE SPUR BEVEL GEARSHAFT - SEALING SURFACES LAPPING.**

(See Figures 1 and 2.)

- a. Lap sealing area to obtain required surface finish and flatness. (See figures 1 and 2.)



**Figure 1. Gearbox Drive Spur Bevel Gearshaft**



1. Sealing surface. Circular runout of this surface shall not exceed 0.0005 inch in relation to common axis of Diameters A and B.
2. 2.107 to 2.112 inches

**Figure 2. Gearbox Drive Spur Bevel Gearshaft - Lapping**

### 3. GEARBOX DRIVE SPUR BEVEL GEARSHAFT - GEARTEETH REPAIR.

(See figure 1.)



Do not attempt to remove all damage. Do not polish repaired area.

- a. Repair minor surface damage by stoning high spots. (See figure 1.)

- b. Break all sharp edges.

### 4. GEARBOX DRIVE SPUR BEVEL GEARSHAFT - BLOCKED OIL HOLES REPAIR.

- a. Remove obstruction from blocked oil holes if oil holes are present.

**5. GEARBOX DRIVE SPUR BEVEL  
GEARSHAFT - SPLINE REPAIR.**

(See Figures 3 and 4.)

**NOTE**

Parent material is AMS 6265  
steel.

a. Repair Area P.

- (1) Strip area to be plated.  
Refer to T.O. 2J-F100-53-1,  
SWP 092 11, (SPOP 29).



Do not bake over 300°F (148°C).

- (2) Nickel plate area. Refer to  
T.O. 2J-F100-53-1,  
SWP 092 11, (SPOP 29),  
0.0010 to 0.0013 inch thick.  
Nickel plating outside  
enclosed area allowed, but  
shall be removed.
- (3) Dimensionally inspect Area J  
to ensure dimensions(6  
through 9 and 26, figure 3)  
are within tolerance. Remove  
excess plate as required.
- (4) Magnetic particle inspect  
gearshaft per  
T.O. 2J-F100-9. No cracks  
permitted.
- (5) Permanently identify with  
beehive symbol adjacent to  
PN identification. Refer to  
T.O. 2J-F100-53-1,  
SWP 023 02, (SPOP 401).

b. Repair Areas H and J.

- (1) Strip area to be plated.  
Refer to T.O. 2J-F100-53-1,  
SWP 092 11, (SPOP 29).



Do not bake over 300°F (148°C).

- (2) Nickel plate area. Refer to  
T.O. 2J-F100-53-1,  
SWP 092 11, (SPOP 29),  
0.001 to 0.002 inch thick.  
Nickel plating enclosed  
subject area permitted but  
shall be removed.
- (3) Dimensionally inspect Areas  
H and J to ensure  
dimensions(2, 3, 10, 12  
through 17 and 24) are  
within tolerance. Remove  
excess plate as required.
- (4) Magnetic particle inspect.  
Refer to T.O. 2J-F100-9. No  
cracks permitted.
- (5) Permanently identify with  
beehive symbol. Refer to  
T.O. 2J-F100-53-1,  
SWP 023 02, (SPOP 401). Deep  
etch adjacent to part number  
identification.

c. Repair Area M.

- (1) Machine to before plate dimension (23). Hold to maximum.
- (2) Magnetic particle inspect. Refer to T.O. 2J-F100-9. No cracks permitted.



No shotpeening on adjacent threads.

- (3) Shotpeen area to be plated to 12A intensity. Refer to T.O. 2J-F100-53-1, SWP 091 08, (SPOP 501).



Do not bake chromium plating.

- (4) Chromium plate area. Refer to T.O. 2J-F100-53-1, SWP 092 06, (SPOP 22). Chromium plating outside enclosed area allowed but must be removed.

- (5) Lap finish area. Refer to T.O. 2J-F100-53-1, WP 091 00.
- (6) Magnetic particle inspect. Refer to T.O. 2J-F100-9. No cracks permitted.
- (7) Permanently identify with beehive symbol. Refer to T.O. 2J-F100-53-1, SWP 023 02, (SPOP 401) deep etch adjacent to part number identification.

d. Repair external threads.

- (1) Use thread file or fine stone to remove thread pickup and high metal. Do not blend thread damage below tooth profile.

e. Repair internal threads.

- (1) Use a 0.375-24 UNJF-38 tap and retap threads.



**Legend for figure 3**

1. 2.075 to 2.095 inch diameter
2. 1.575 to 1.587 inch diameter
3. 1.439 to 1.459 inch diameter
4. 1.200 to 1.240 inch diameter
5. 1.3728 to 1.3737 inch diameter
6. 0.940 to 0.960 inch
7. 2.040 to 2.060 inches
8.  $30^{\circ} \pm 2^{\circ}$
9. 1.150 to 1.155 inch diameter
10. 3.100 to 3.120 inches
11. 1.125 inch minimum diameter
12. 1.760 to 1.780 inch diameter
13. 0.020 to 0.030 inch radius
14. 0.047 to 0.078 inch mod. radius
15.  $40^{\circ} \pm 10^{\circ}$
16. 0.020 to 0.030 inch radius
17. Break edge  $30^{\circ} \pm 2^{\circ}$ , 0.015 to 0.030 inch
18. Chamfer  $45^{\circ} \pm 5^{\circ}$ , 0.020 to 0.040 inch
19. 3.170 to 3.180 inches
20. 3.130 to 3.140 inches
21. Circular runout of this surface shall not exceed 0.0005 inch in relation to the common axis of Diameters A and B.
22. Circular runout of this surface shall not exceed 0.004 inch in relation to the common axis of Diameters A and B.
23. 2.1035 to 2.1065 inches before plate. 2.116 inches after plate. 2.109 to 2.111 inches finish dimension.
24. 0.000 to 0.060 inch
25. 0.000 to 0.060 inch
26. 1.150 to 1.155 inch inner diameter
27. This surface shall be perpendicular within 0.002 inch to Diameter K, regardless of feature size.
28. Circular runout of Diameter B shall not exceed 0.0002 inch in relation to the common axis of Diameters A and B.
29. This diameter at maximum material condition shall be located within 0.010 inch diameter of true position in relation to Surface G, and Diameter K at maximum material condition.
30. Circular runout of Diameter A shall not exceed 0.0002 inch in relation to the common axis of Diameters A and B.
31. Diameter K, regardless of feature size, shall be concentric within 0.002 inch diameter of true position to spline. Pitch Diameter E, regardless of feature size.
32. Circular runout of spline Pitch Diameter E shall not exceed 0.0025 inch in relation to the common axis of Diameters A and B.

**NOTE**

- Blend nicks and dents to acceptable depth limit of 0.003 inch.
- Blend scratches to acceptable depth limit of 0.0005 inch.
- f. Repair nicks, dents, and scratches in areas other than sealing surface, gear teeth, bearing journals, splines and threads. Blend defects as follows:
  - (1) Remove minimum amount of material.
  - (2) Use smooth stone on raised metal and sharp edges.
  - (3) Blend all surfaces to extend 15 times beyond the depth of damage.
  - (4) Blend all surfaces to be as smooth as, or smoother than, original finish.
- g. Repair inner pilot diameter. (See figure 4.)
  - (1) Inspect inner pilot diameter. Diameter shall be 1.3728 to 1.3737 inch diameter for minimum Distance D.
  - (2) If required, machine inner pilot diameter to 1.382 to 1.390 inches holding to minimum value for minimum Distance D.
  - (3) Mask inner pilot diameter surface to be plated.
  - (4) Hot wax dip part as required.
  - (5) Remove masking material from inner pilot diameter surface.
  - (6) Nickel plate to thickness of 0.003 to 0.006 inch and 1.363 inch diameter maximum for minimum Distance D. Refer to T.O. 2J-F100-53-1, SWP 092 11, (SPOP 29).
  - (7) Magnetic particle inspect all machined/plated areas. Refer to T.O. 2J-F100-9.
  - (8) Finish machine inner pilot diameter to 1.3728 to 1.3737 inches for minimum Distance D. Maintain concentricity and other requirements. (See figure 4.)
  - (9) Dynamic balance. Dynamic unbalance when mounted on Diameters A and B shall not exceed 0.02 ounce-inch per plane in Planes H and J at 900 RPM minimum. Correct unbalance by removing material. (See Views H and G.)
    - (a) Mount gearshaft on PWA 50674 and PWA 50675 bearing halves.
    - (b) Calibrate balance machine using PWA 50676 and PWA 50677 calibration weights.
    - (c) All edges and surfaces resulting from material removal for balancing shall be smooth and continuous.
  - (10) Magnetic particle inspect final machined diameter. Refer to T.O. 2J-F100-9.



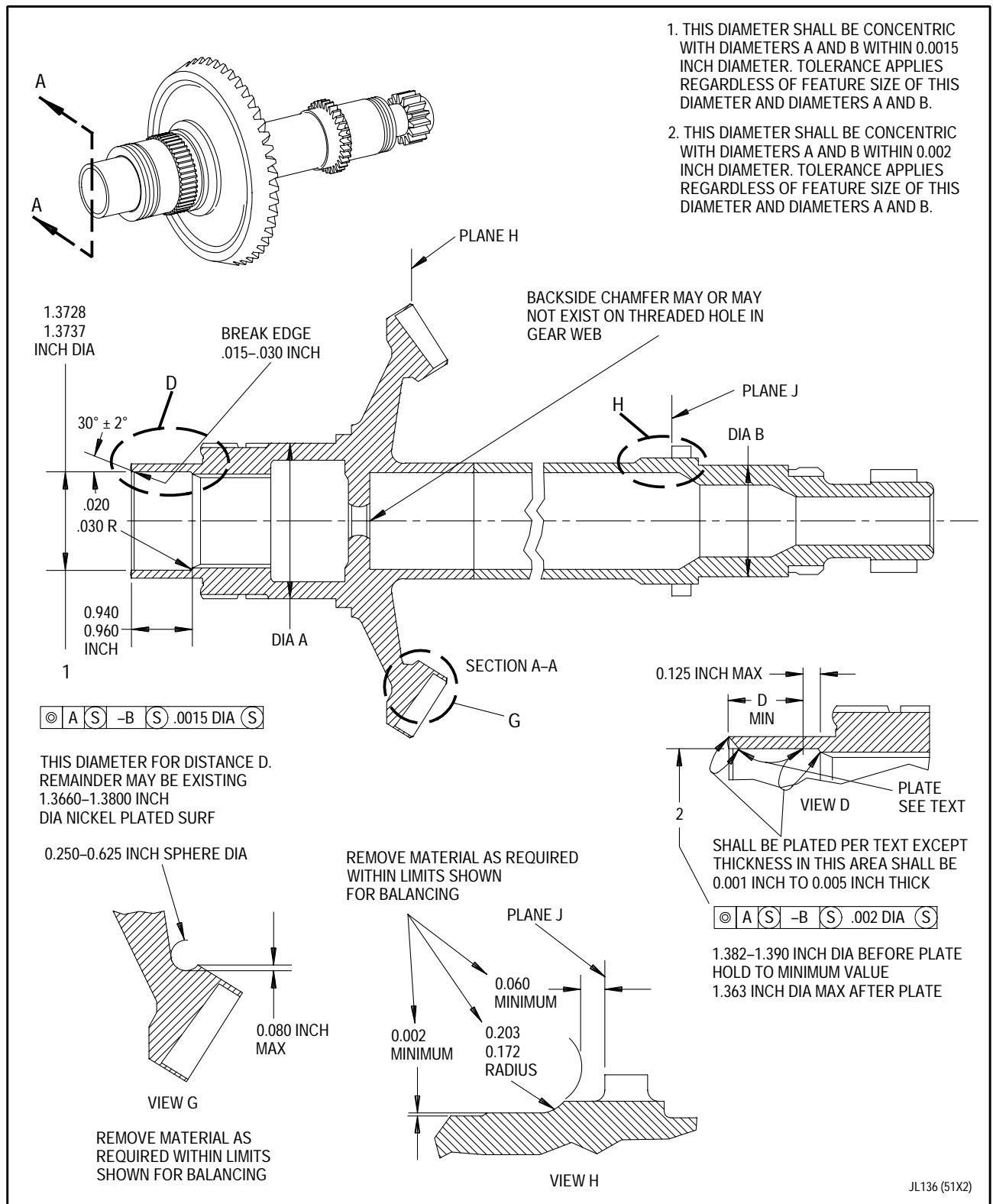


Figure 4. Gearbox Drive Spur Bevel Gearshaft - Repair of Inner Pilot Diameter

**6. GEARBOX DRIVE SPUR BEVEL  
GEARSHAFT - BEARING JOURNAL REPAIR.**

(See Figure 5.)

**NOTE**

Before finish machining, (See figure 5.) 0.010 inch maximum bearing journal chromium plating thickness is allowed. After machining, 0.0025 inch minimum and 0.0075 inch maximum chromium plate shall remain on journal surface. Machine only to clean up galling, scratches, and previous plating.

(Example: bearing journal requirement is 1.5295 to 1.5300 inch diameter; journal cleanup machining is 1.5150 to 1.5245 inch diameter; plating is 0.020 inch (0.010 inch on a side) maximum over cleaned up diameter.

- a. Machine bearing journal(3) to dimensions shown to clean up galling, scratches, and previous plate. Remove only material required to eliminate surface damage or previous plating.

**Legend for figure 5**



Part has carburized areas and must be shotpeened. Do not bake.

**NOTE**

Part is made of AMS 6265 steel and has Rockwell hardness of A81 to 85 or equivalent.

1. Chromium plate area
2. Clean up machine 1.5602 to 1.5699 inch diameter prior to plating. Final machine 1.5747 to 1.5754 inch diameter.
3. Clean up machine 2.1509 to 2.1605 inch diameter prior to plating. Final machine 2.1654 to 2.1660 inch diameter.
4. 0.040 to 0.055 inch
5. 0.240 to 0.260 inch. Two slots equally spaced.
6. Chamfer 0.015 to 0.030 inch x 45° ±5°
7. 0.359 to 0.391 inch radius (2 places)
8. 1.460 to 1.480 inches to Surface C
9. Circular runout of Diameter B(2) shall not exceed 0.0002 inch in relation to the common axis of Diameters A(3) and B(2).
10. Diameter B shall be perpendicular within 0.0005 inch to Surface D at maximum material condition.
11. Circular runout of Diameter A(3) shall not exceed 0.0002 inch in relation to the common axis of Diameters A(3) and B(2).
12. Slot(5) at maximum material condition shall be located within 0.010 inch total in relation to Surface C, and Diameter A(3) at maximum material condition.

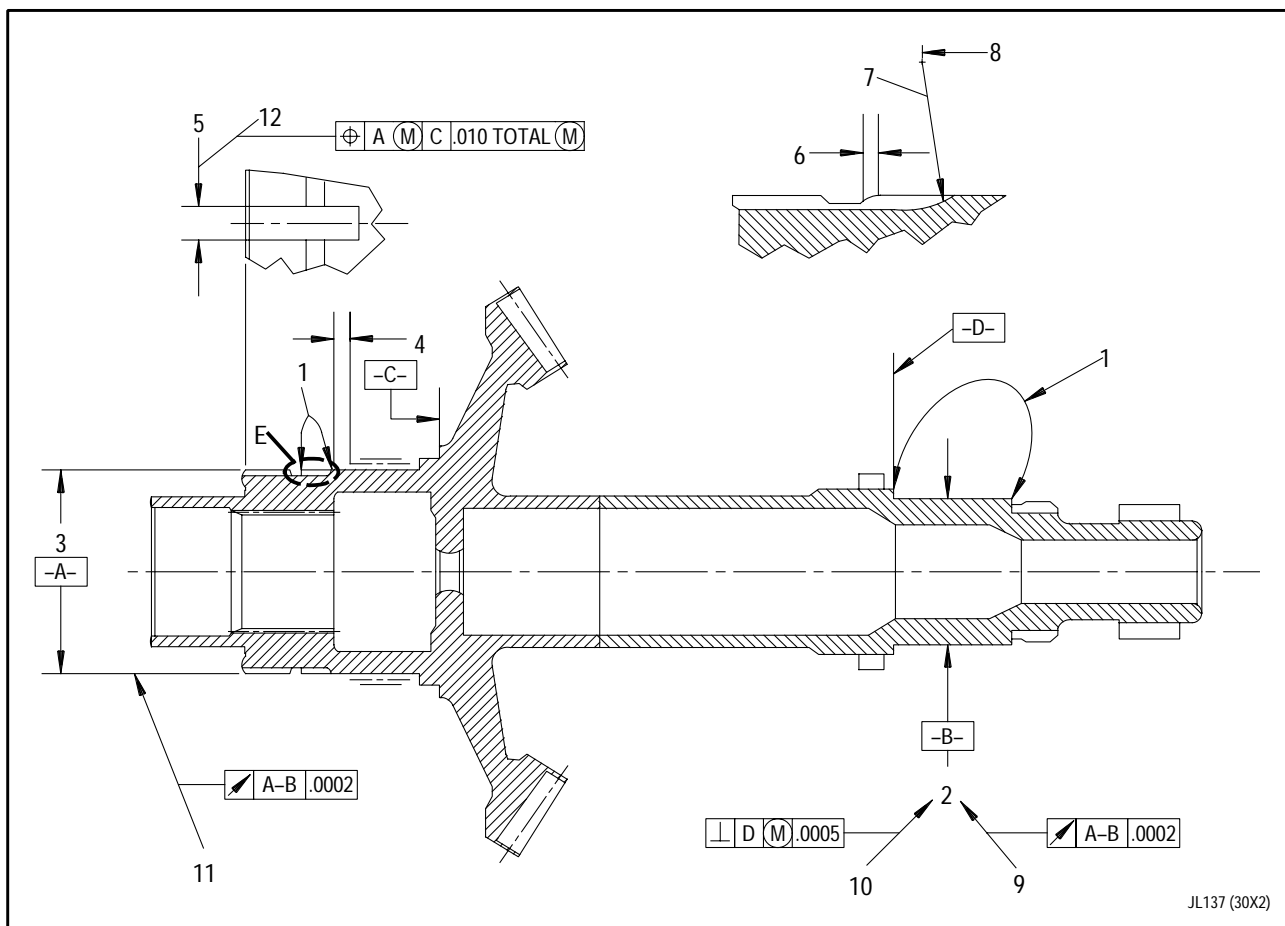


Figure 5. Gearbox Drive Spur Bevel Gearshaft - Plating Repair

- b. Machine bearing journal(2) to dimensions shown to clean up galling, scratches, and previous plate. Remove only material required to eliminate surface damage or previous plating.
- c. Wax off all areas not requiring chrome plating.
- d. Chromium plate to 0.020 inch (0.010 inch on a side) maximum over actual cleaned up diameter. Refer to T.O. 2J-F100-53-1, SWP 092 06, (SPOP 22).
- e. Finish machine to dimensions shown.



**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**GEAR, INTERNAL, MAIN FUEL PUMP DRIVE -**

**REPAIR**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 6

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 5 . . . . .	0	6 Blank . . . . .	0		

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

- a. This work package contains instructions for repairing main fuel pump drive internal gear.

**2. MAIN FUEL PUMP DRIVE INTERNAL GEAR -  
GEARTEETH REPAIR.**

(See Figure 1.)

- a. Nondestructive inspect machined surfaces. Refer to T.O. 2J-F100-9.



Do not attempt to remove all damage. Do not polish repaired area.

- b. Repair minor surface damage by stoning high spots. (See figure 1.)
- c. Break all sharp edges.

**3. MAIN FUEL PUMP DRIVE INTERNAL  
GEAR - BLOCKED OIL HOLES REPAIR.**

(See figure 1.)

- a. Remove obstruction from blocked oil holes. (See figure 1.)

**4. MAIN FUEL PUMP DRIVE INTERNAL  
GEAR - EXTERNAL THREADS REPAIR.**

(See figure 1.)

- a. Use thread file or fine stone to remove thread pickup and high metal. Do not blend thread damage below tooth profile. (See figure 1.)

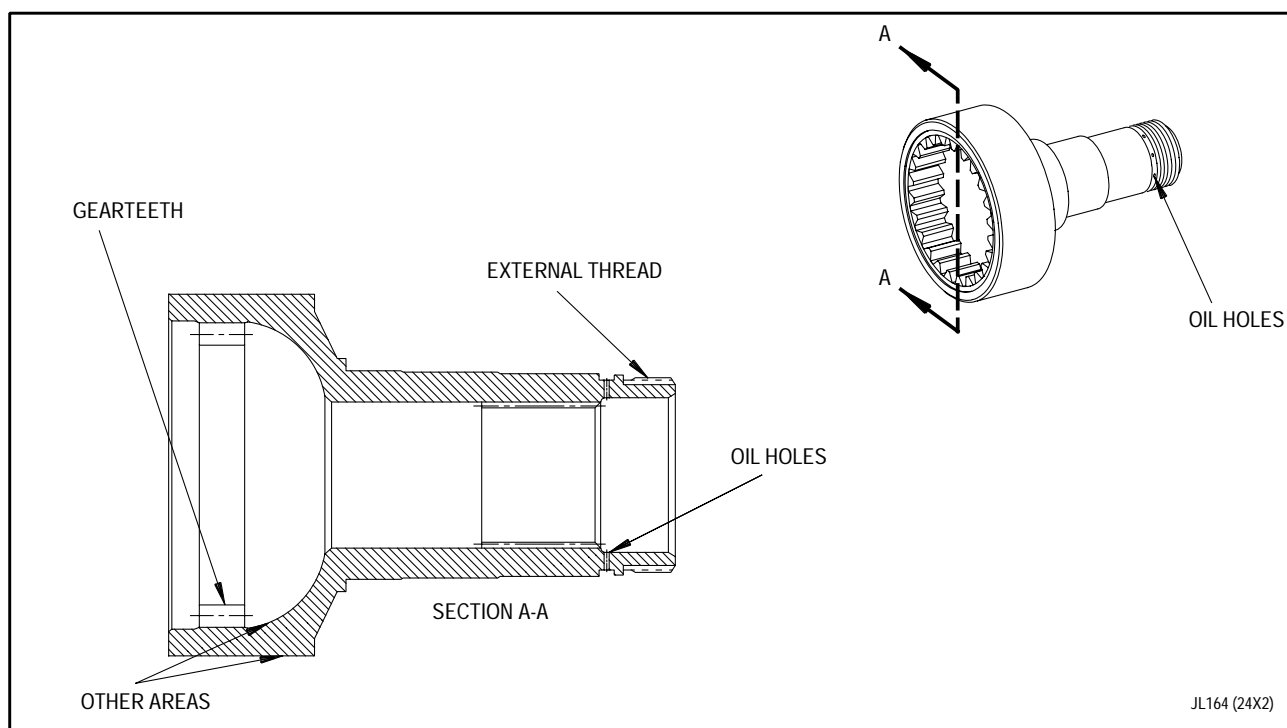
**5. MAIN FUEL PUMP DRIVE INTERNAL  
GEAR - OTHER AREAS REPAIR.**

(See figure 1.)

- a. Repair nicks, dents, and scratches in areas other than gear teeth, bearing journals, splines and threads. (See figure 1.) Blend defects as follows:

- (1) Remove minimum amount of material.
- (2) Use smooth stone on raised metal and sharp edges.
- (3) Blend all surfaces to be as smooth as, or smoother than original finish.





**Figure 1. Main Fuel Pump Drive Internal Gear - Repair**



# WORK PACKAGE

## TECHNICAL PROCEDURES

### SHAFT, GEARBOX IDLER GEAR -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 5	0	6 Blank	0		

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Plating, Chromium on Steel, Nickel, or Cobalt	SWP 092 06
(SPOP 22) - - - - -	

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

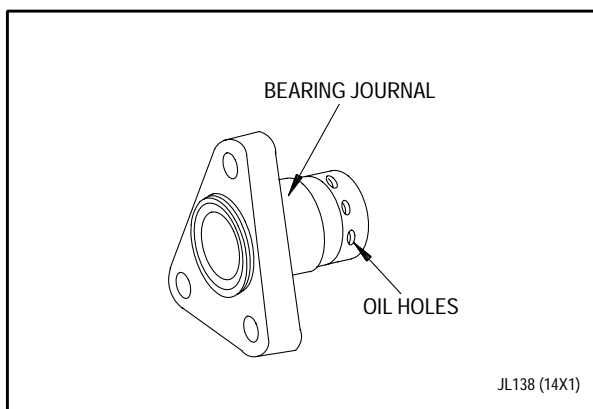
**1. INTRODUCTION.**

- a. This work package contains instructions for repairing the gearbox idler gearshaft.

**2. GEARBOX IDLER GEARSHAFT - BLOCKED OIL HOLE REPAIR.**

(See Figure 1.)

- a. Remove obstruction from blocked oil hole.



**Figure 1. Gearbox Idler Gearshaft - Repair**

**3. GEARBOX IDLER GEARSHAFT - BEARING JOURNAL REPAIR.**

(See figure 1 and Figure 2.)

**NOTE**

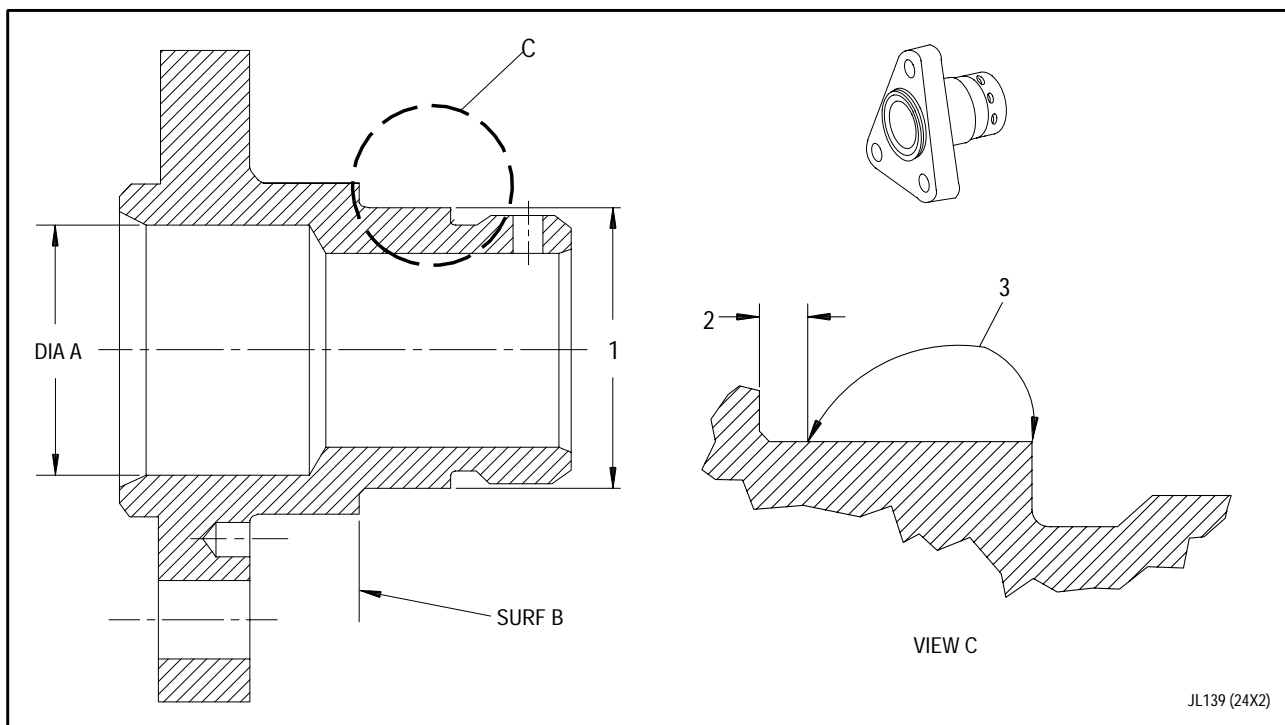
Before finish machining, 0.010 inch maximum bearing journal chromium plating thickness is allowed. After machining, 0.0025 inch minimum and 0.0075 inch maximum chromium plate shall remain on journal surface. Machine only to clean up galling, scratches, and previous plating. (Example: bearing journal requirement is 0.9844 to 0.9852 inch diameter; journal cleanup machining is 0.9702 to 0.9794 inch diameter; plating is 0.020 inch (0.010 inch on a side) maximum over cleaned up diameter.

- a. Machine bearing journals to dimensions shown to clean up galling, scratches, and previous plate. Remove only material required to eliminate surface damage or previous plating.

- b. Mask areas not to be plated.
- c. Chromium plate to 0.020 inch (0.010 inch on a side) maximum over actual cleaned up diameter. Refer to T.O. 2J-F100-53-1, SWP 092 06, (SPOP 22).
- d. Finish machine to dimensions shown.

**4. GEARBOX IDLER GEARSHAFT - ALL OTHER AREAS REPAIR.**

- a. Remove high spots from nicks, scratches and gouges.
- b. Polish to smoothness of original finish.



## NOTE

Part is made of AMS 6322 steel and has Rockwell hardness of C26 to 32 or equivalent.

1. Clean up machine 0.9702 to 0.9794 inch diameter, hold to maximum. Finish machine 0.9844 to 0.9852 inch diameter. This diameter must be concentric with Diameter A within 0.0005 inch FIR and square with Surface B within 0.001 inch total.
2. 0.015 to 0.030 inch
3. Chromium plate area

**Figure 2. Gearbox Idler Gearshaft - Plating Repair**





# WORK PACKAGE

## TECHNICAL PROCEDURES

### SHAFT, GEARBOX DEAERATOR IMPELLER -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 18

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 18	.	.	.	.	0

## REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Marking, Electrochemical (SPOP 401) - - - - -	SWP 023 02
Peening, Steel Shot (SPOP 501) - - - - -	SWP 091 08
Plating, Chromium on Steel, Nickel or Cobalt (SPOP 22) - - - - -	SWP 092 06

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

None

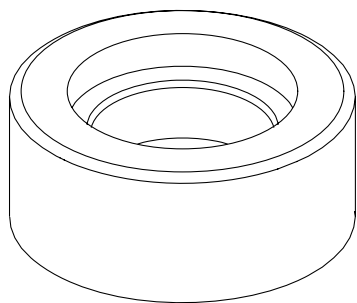
## EXPENDABLE ITEMS

None

## APPLICABLE SUPPORT EQUIPMENT

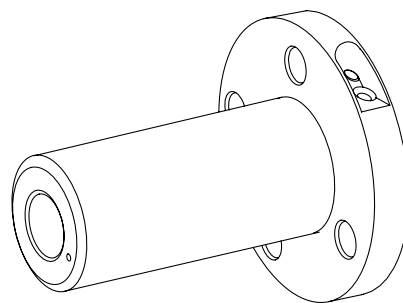
Paragraph	Function - Tool Nomenclature	Tool Number
2	Gearbox Deaerator Impeller Shaft - Sealing Surface Lapping	
	Holder Lap, Gearbox deaerator impeller shaftsealing surface - - - - -	PWA 52839
3	Gearbox Deaerator Impeller Shaft - Bearing Journal Repair	
	Chuck, hydraulic - - - - -	SAALC 8041555
	Plug, Set master - - - - -	SAALC 8041556
	Fixture, plating - - - - -	SAALC 8041563
4	Gearbox Deaerator Impeller Shaft - Sealing Surfaces Chromium Plate Repair	
	Fixture - - - - -	SAALC 8041557
	Holder, Test strip - - - - -	SAALC 8041558
	Cover - - - - -	SAALC 8041559
	Cover - - - - -	SAALC 8041560
	Cover - - - - -	SAALC 8041561
	Fixture, Plating - - - - -	SAALC 8041562

ILLUSTRATED SUPPORT EQUIPMENT



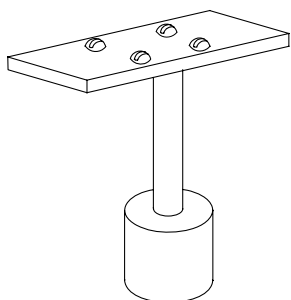
PWA 52839 -C

**Figure T1. PWA 52839 Holder**



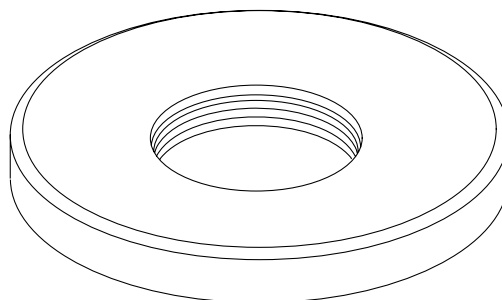
SAALC 8041555 -C

**Figure T2. SAALC 8041555 Chuck**



SAALC 8041558 -C

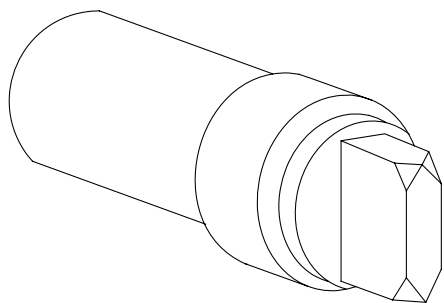
**Figure T3. SAALC 8041558 Holder**



SAALC 8041559 -C

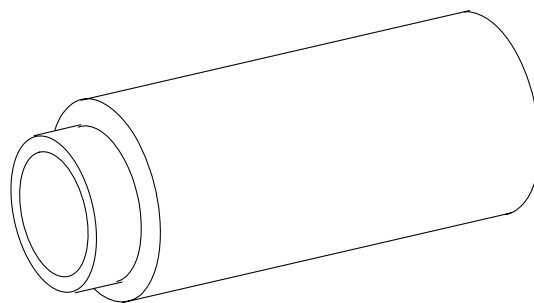
**Figure T4. SAALC 8041559 Cover**

**ILLUSTRATED SUPPORT EQUIPMENT**



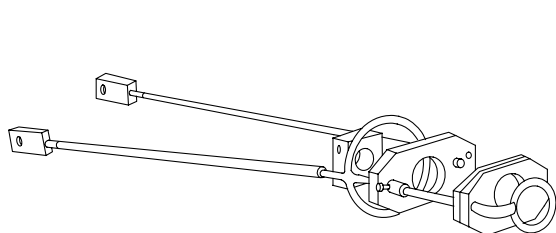
SAALC 8041560 -C

**Figure T5. SAALC 8041560 Cover**



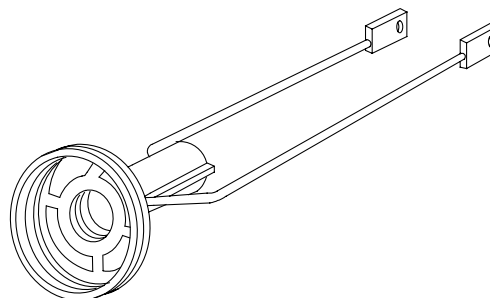
SAALC 8041561 -C

**Figure T6. SAALC 8041561 Cover**



SAALC 8041562 -C

**Figure T7. SAALC 8041562 Fixture**



SAALC 8041563 -C

**Figure T8. SAALC 8041563 Fixture**

**1. INTRODUCTION.**

- a. This work package contains instructions for repairing gearbox deaerator impeller shaft.

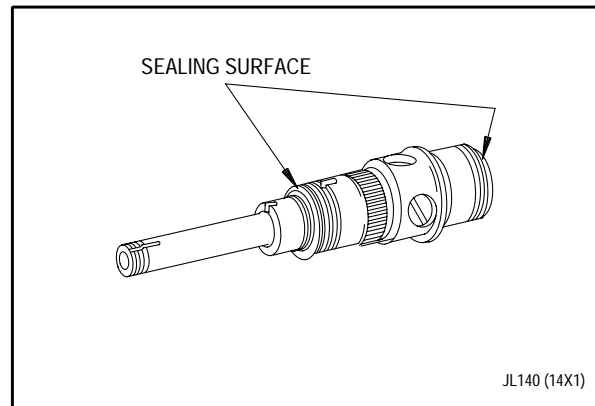
## 2. GEARBOX DEAERATOR IMPELLER SHAFT - SEALING SURFACE LAPPING REPAIR.

(See Figures 1 and 2.)

- a. Lap sealing area to obtain required surface finish and flatness. (See figures 1 and 2.)
- b. Use PWA 52839 holder lap to hold gearbox deaerator impeller shaft in a vertical position while lapping large diameter end of shaft as follows:

- (1) Place PWA 52839 holder on lapping surface of any standard lapping machine with large ID down.

- (2) Insert large diameter end of shaft into ID of this tool, and lap end of shaft.



**Figure 1. Gearbox Deaerator Impeller Shaft - Repair**



### 3. GEARBOX DEAERATOR IMPELLER SHAFT - BEARING JOURNAL REPAIR.

(See figure 1 and Figures 3, 4, and 5.)

#### NOTE

Before finish machining, 0.010 inch maximum bearing journal chromium plating thickness is allowed. After machining, 0.0025 inch minimum and 0.0075 inch maximum chromium plate must remain on journal surface. Machine only to clean up galling, scratches, and/or previous plating. (Example: bearing journal requirement is 1.3781 to 1.3789 inch diameter; journal cleanup machining is 1.3639 to 1.3731 inch diameter; plating is 0.020 inch (0.010 inch on a side) maximum over cleaned up diameter.) (See figure 3.)

a. Machine bearing journals using SAALC 8041555 hydraulic chuck as follows:

- (1) Wipe clean locating surfaces on chuck.
- (2) Position chuck on machine table and install SAALC 8041556 set master plug.

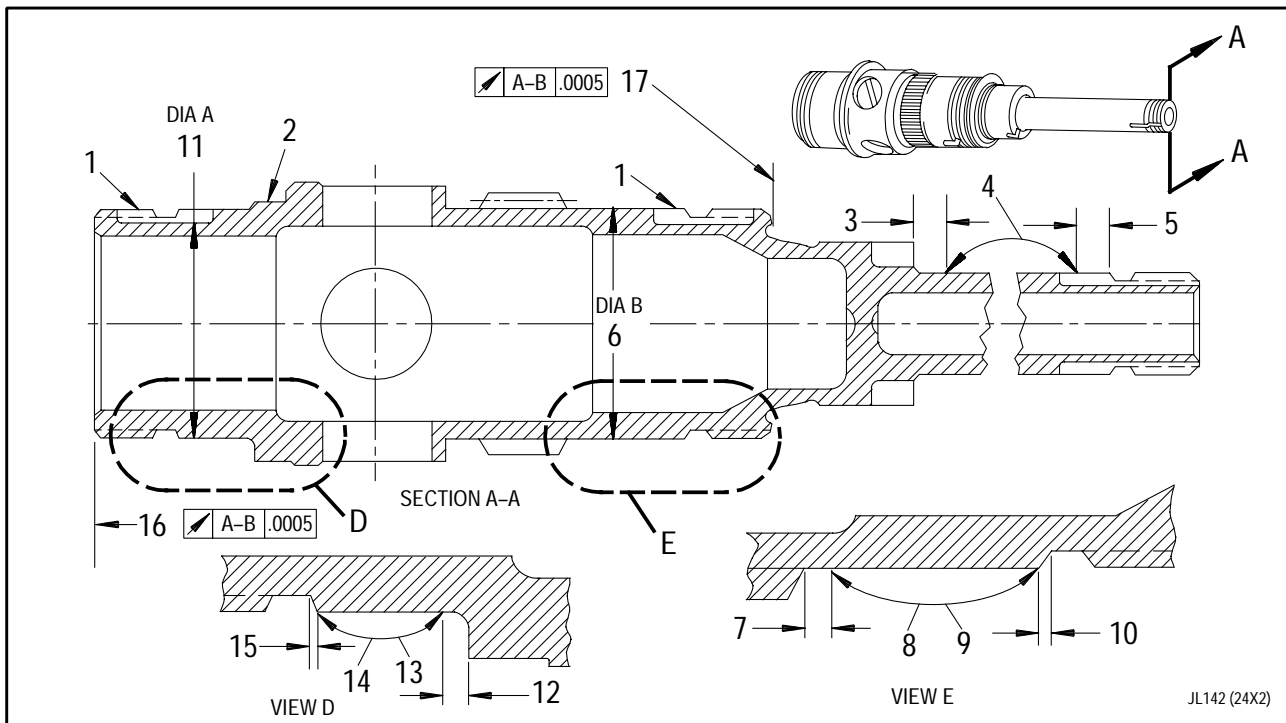


Figure 3. Gearbox Deaerator Impeller Shaft - Plating Repair



**Legend for figure 3**

Part has carburized areas and shall be shotpeened. Do not bake.

1. Slot, 2 each. Ensure slots are thoroughly masked.
2. Flat, 3 each. Ensure flats are thoroughly masked.
3. 0.125 inch minimum
4. Electrical contact permitted in this area. No burning, pitting, or selective attach permitted.
5. 0.125 inch minimum
6. Clean up machine 1.3639 to 1.3731 inches diameter.
7. 0.040 to 0.055 inch
8. Shotpeen enclosed area. Omit bake cycle.
9. Chromium plate enclosed area. See text. Omit bake cycle. Final machine 1.3781 to 1.3789 inches diameter. Circular runout of this diameter when mounted on Diameters B and C shall be within 0.0005 inch FIR.
10. Chamfer 0.015 to 0.030 inch x 45° ±5°
11. Clean up machine 1.3639 to 1.3731 inches diameter.
12. 0.039 to 0.054 inch
13. Shotpeen enclosed area. Omit bake cycle.
14. Chromium plate enclosed area. See text. Omit bake cycle. Final machine 1.3781 to 1.3789 inches diameter. Circular runout of this diameter when mounted on Diameters B and C shall be within 0.0005 inch FIR.
15. Chamfer 0.015 to 0.030 inch x 45° ±5°
16. Circular runout of this surface shall be within 0.0005 inch in relation to Diameters B and C.
17. Circular runout of this surface shall be within 0.0005 inch in relation to Diameter B and C.

**NOTE**

Part is made of AMS 6265 steel and has Rockwell hardness of A81 to 85 or equivalent.



Activate chuck only when part or master is in place.

- (3) Activate hydraulic chuck.
- (4) Centralize chuck by taking runout on 1.3781 to 1.3789 inches OD of set master plug.
- (5) When desired runout is obtained, secure chuck to machine table.
- (6) Deactivate chuck and remove plug.
- (7) Load shaft front or rear end down. (See figure 4.)

(8) With rawhide or phenolic mallet tap shaft to make sure proper contact between shaft and chuck has been made.

(9) Activate hydraulic chuck.

(10) Machine bearing journals to dimensions shown to clean up galling, scratches, and previous plate. Remove only material required to eliminate surface damage or previous plate.

(11) Deactivate chuck and remove shaft when both journals have been machined.

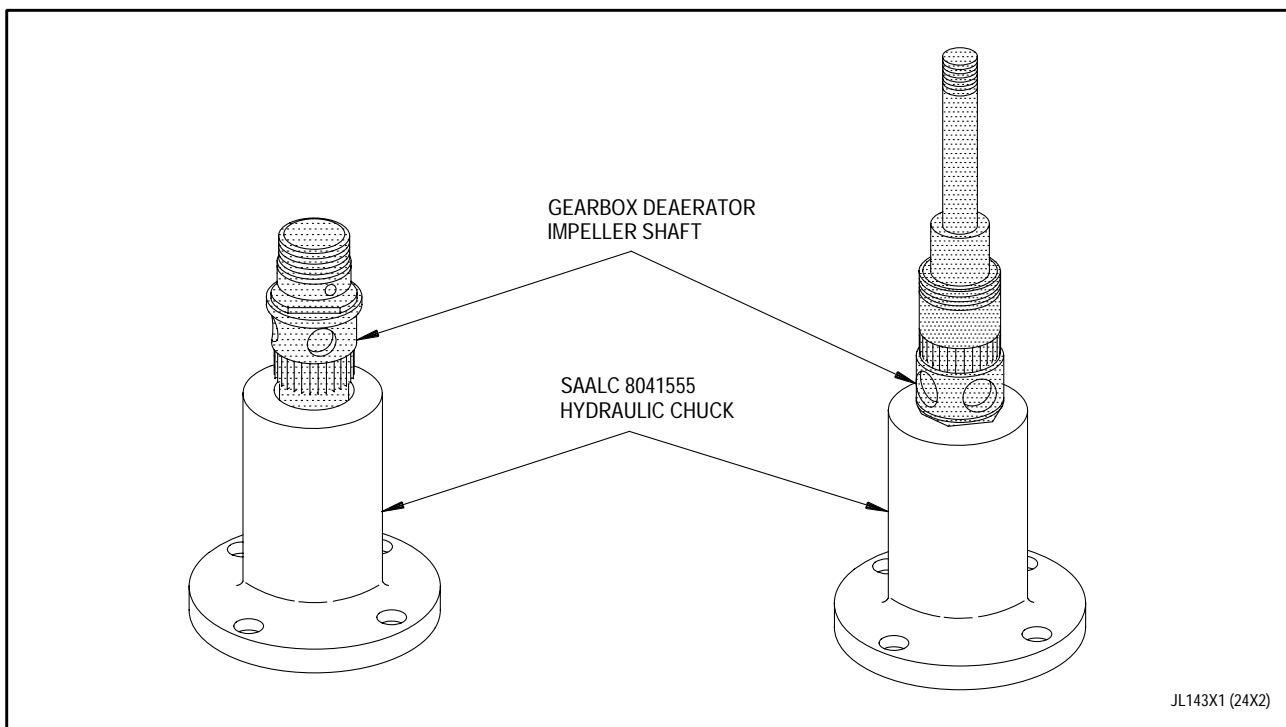
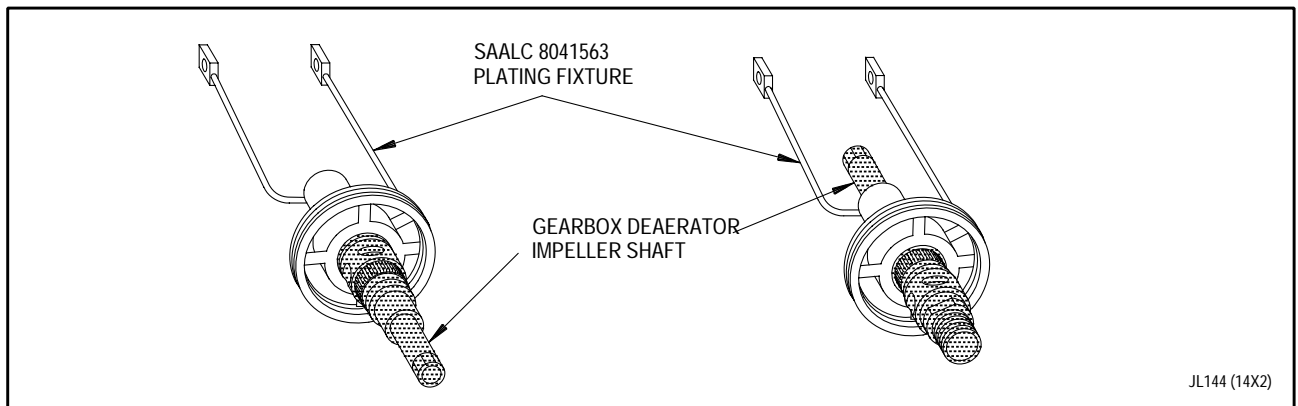


Figure 4. SAALC 8041555 Hydraulic Chuck - Application

- b. Mask areas not to be plated.
- c. Chromium plate bearing journals using SAALC 8041563 plating fixture as follows:
  - (1) Remove detail-2 anode and detail-4 insulating ring by removing detail-3 screw.
  - (2) Load shaft by threading front end first into bottom of detail-1 holder for plating of front OD, or rear end first for plating of rear OD. (See figure 5.)
  - (3) Dip holder with part in hot wax as required.
  - (4) Remove masking material from surface to be plated.
  - (5) Install details-4, 2, and -3 again in that order.
  - (6) Proceed to chrome plate to 0.020 inch (0.010 inch on a side) maximum over actual cleaned up diameter. Refer to T.O. 2J-F100-53-1, SWP 092 06, (SPOP 22).
  - (7) Remove part from plating fixture.
- d. Install shaft in SAALC 8041555 chuck again and finish machine plated area to dimensions shown.
- e. Inspect shaft using magnetic particle inspection procedure. Refer to T.O. 2J-F100-9. No cracks permitted.
- f. Mark part with beehive symbol shallow etch. Refer to T.O. 2J-F100-53-1, SWP 023 02, (SPOP 401).



**Figure 5. SAALC 8041563 Plating Fixture - Application**

**4. GEARBOX DEAERATOR IMPELLER SHAFT -  
SEALING SURFACES CHROMIUM PLATE  
REPAIR.**

(See Figures 6 through 12.)

- a. Machine sealing surfaces to dimensions shown, hold to maximum value. (See figure 6.)
- b. Inspect shaft using magnetic particle inspection procedure. Refer to T.O. 2J-F100-9. No cracks permitted.



Part has carburized areas and shall be shotpeened. Do not bake.

- c. Shotpeen area to be plated using SAALC 8041557 fixture as follows:
  - (1) Position SAALC 8041557 fixture central on shot peen platform.
  - (2) Zero fixture by indicating inner locating diameter on fixture.
  - (3) When desired runout is obtained, secure fixture to platform.
  - (4) Install SAALC 8041558 test strip holder onto fixture. (See figure 7.)

- (5) Load appropriate Almin test strip under four screw heads and secure in place.
- (6) Adjust nozzles, perform test, measure Almin test strip. When 12A intensity is obtained, secure nozzles. Remove SAALC 8051558 holder.
- (7) Load shaft front or rear end down. (See figure 8.)
- (8) Thread SAALC 8041559 cover on front outer diameter until flush with adjacent end surface. (See figure 9.)
- (9) Use SAALC 8041560 cover to protect front inner diameter of shaft during shotpeening of front end surface. (See figure 10.)
- (10) Use SAALC 8041561 cover to protect rear OD of shaft. (See figure 11.)
- (11) Shotpeen area to be plated with intensity equivalent to 12A. Refer to T.O. 2J-F100-53-1, SWP 091 08, (SPOP 501).

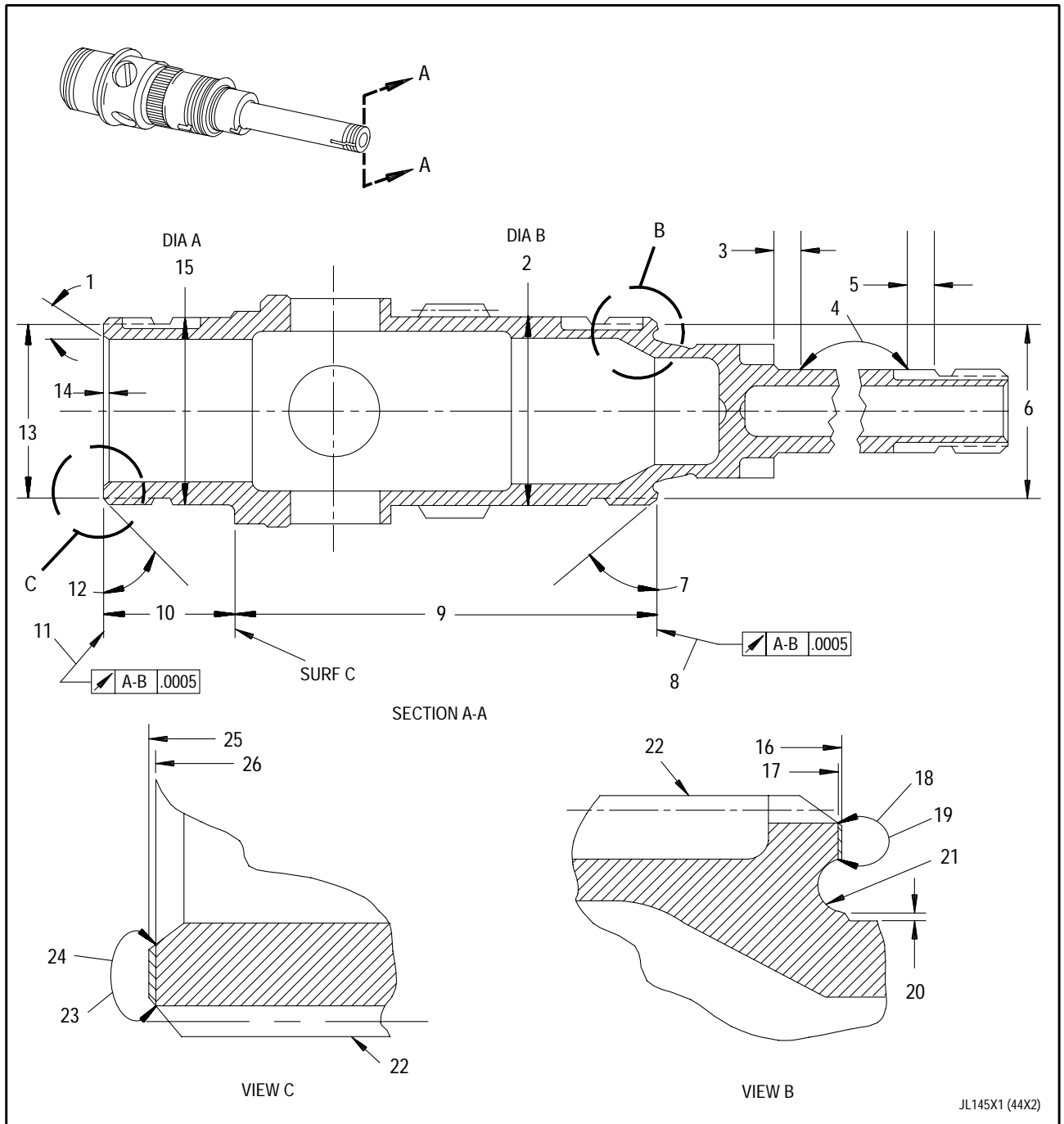


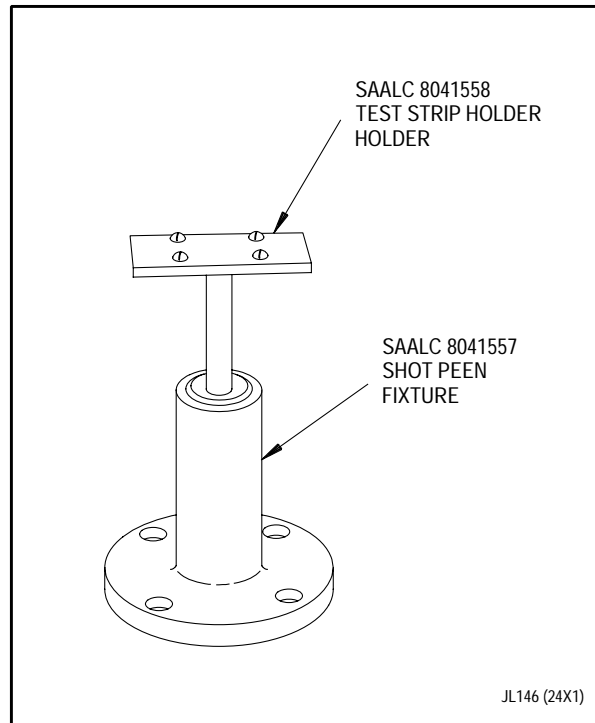
Figure 6. Gearbox Deaerator Impeller Shaft - Sealing Surface Repair

Legend for figure 6

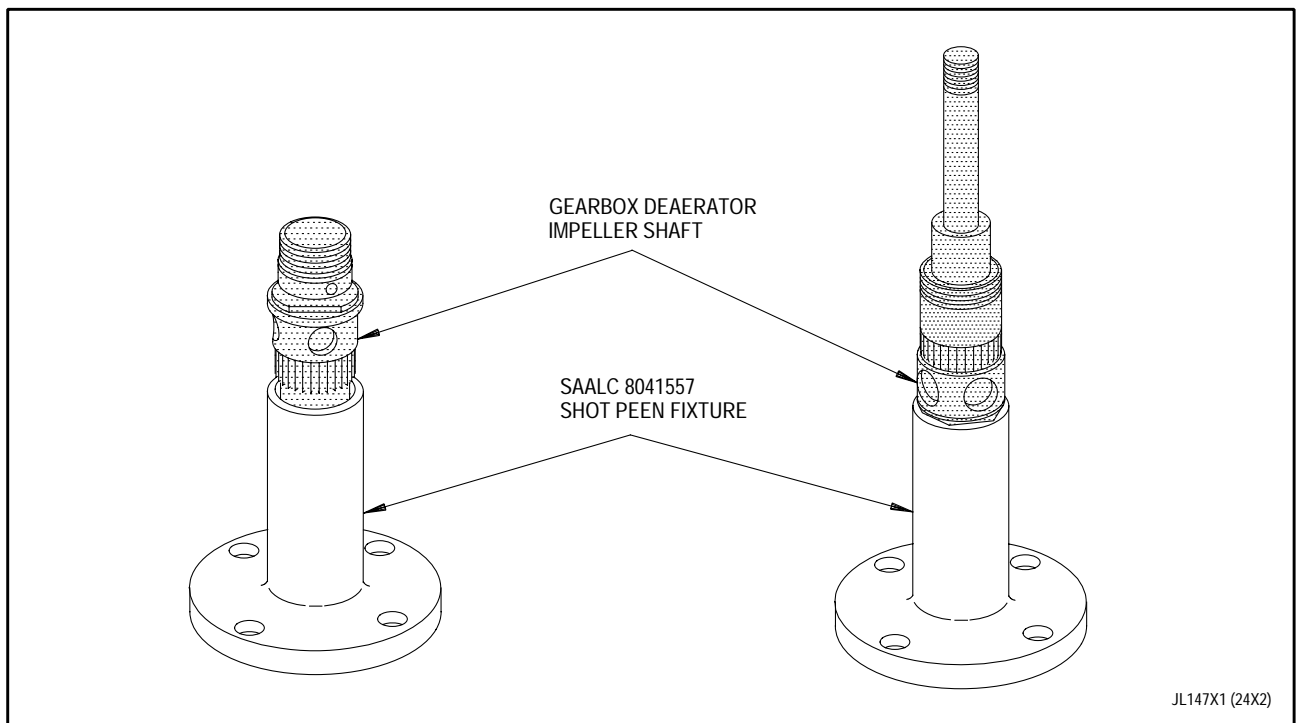


Part has carburized areas and shall be shotpeened. Do not bake.

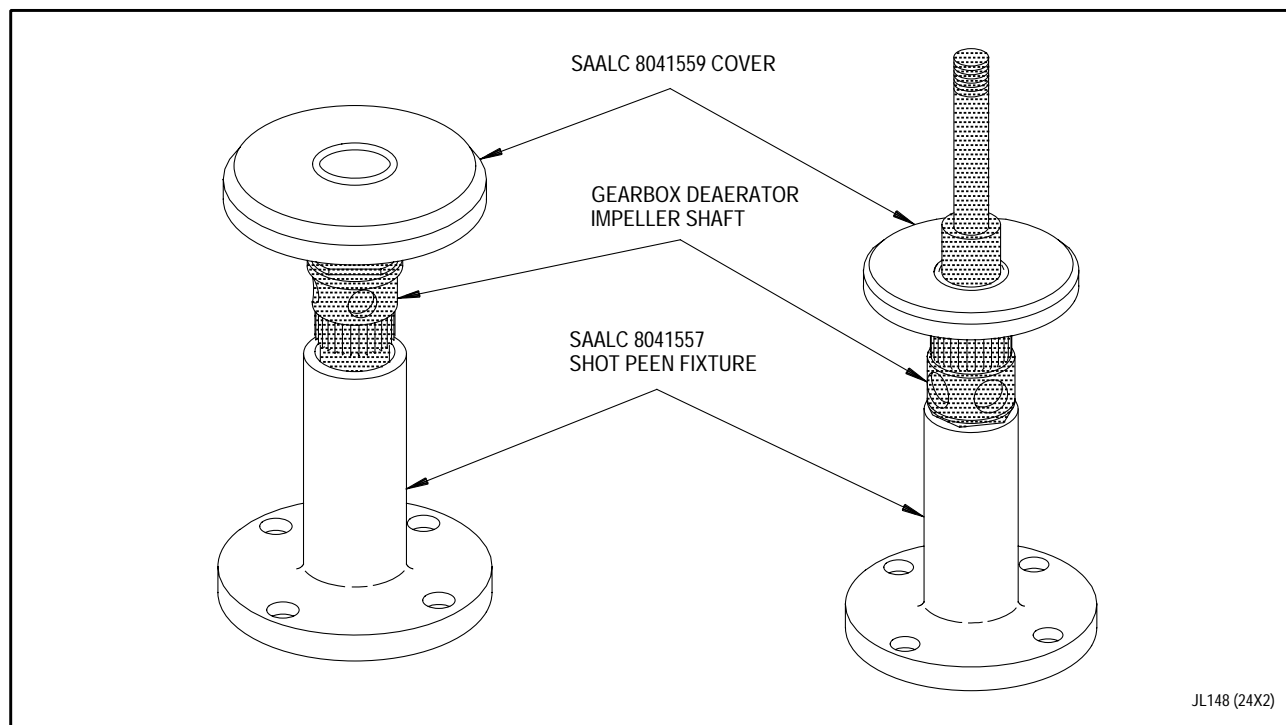
1.  $30^{\circ} \pm 2^{\circ}$
2. 1.3789 inches, Diameter B
3. 0.125 inch minimum
4. Electrical contact permitted in this area. No burning, pitting or selective attack permitted.
5. 0.125 inch minimum
6. 1.300 to 1.310 inch diameter, after chromium plating.
7.  $45^{\circ} \pm 2^{\circ}$
8. Circular runout of this surface shall be within 0.0005 inch in relation to Diameters A and B.
9. Clean up machine 3.098 to 3.102 inches after chromium plating.
10. Clean up machine 0.988 to 0.990 inch after chromium plating.
11. Circular runout of this surface shall be within 0.0005 inch in relation to Diameters A and B.
12.  $45^{\circ} \pm 2^{\circ}$
13. Clean up machine 1.300 to 1.310 inches diameter after chromium plating.
14. 0.020 to 0.040 inch
15. 1.3789 inches, Diameter A
16. 3.105 to 3.107 inches to Surface C.
17. 3.0945 to 3.0960 inches to Surface C. Machine prior to plating. Hold to maximum value.
18. Shotpeen enclosed area. Omit bake requirement.
19. Chromium plate enclosed area to dimension(16). See text.
20. 0.005 inch maximum
21. 0.016 to 0.047 inch radius
22. 1.375-UNJEF-3A
23. Shotpeen enclosed area. Omit bake requirement.
24. Chromium plate enclosed area to dimension(25). See text.
25. 0.993 to 0.995 inch to Surface C.
26. 0.9825 to 0.9860 inch to Surface C. Machine prior to plating. Hold to maximum value.



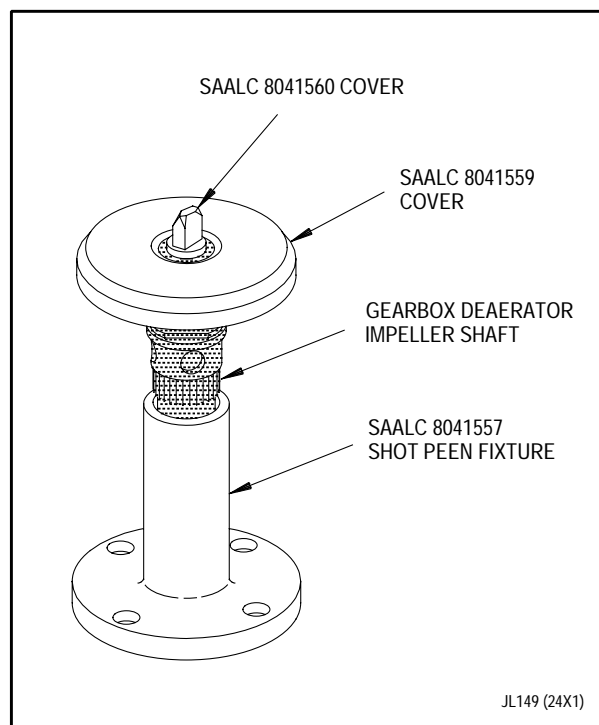
**Figure 7. SAALC 8041558 Test Strip Holder**



**Figure 8. SAALC 8041557 Shot Peen Fixture - Application**

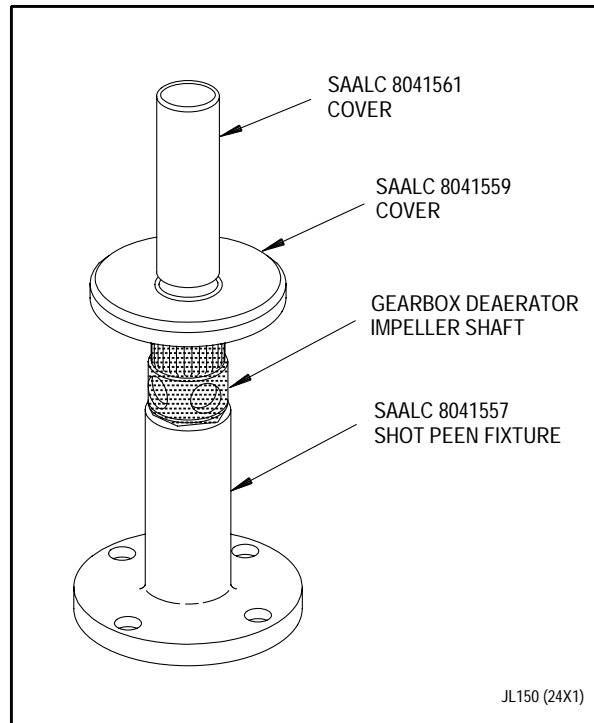


**Figure 9. SAALC 8041557 Shot Peen Fixture - Application**



**Figure 10. SAALC 8041557 Shot Peen Fixture - Application**

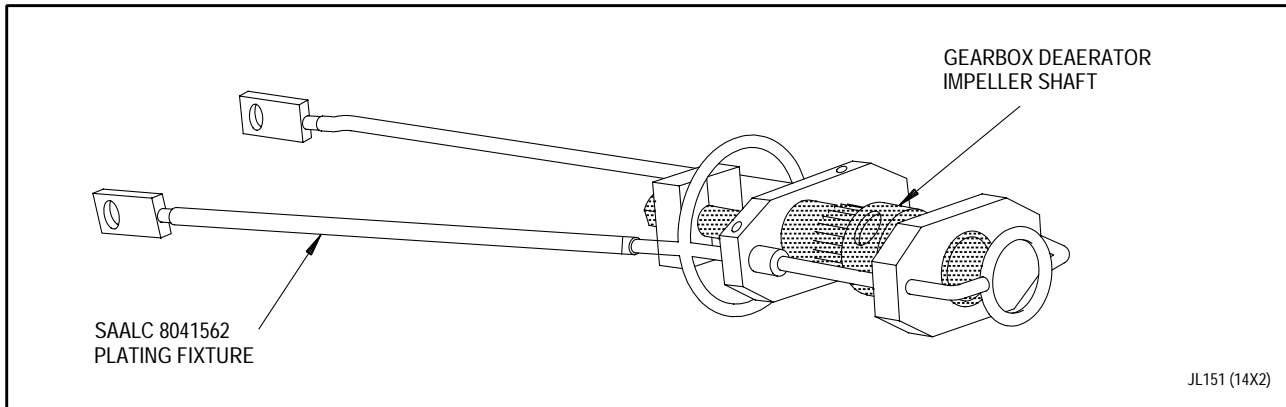




**Figure 11. SAALC 8041557 Shot Peen Fixture - Application**

d. Chromium plate seal seats of shaft using SAALC 8041562 plating fixture as follows:

- (1) Mask surfaces of shaft to be plated.
- (2) Loosen detail-10 cap screw two places on SAALC 8041562 fixture.
- (3) Loosen detail-7 thumb screw and remove detail-3 coupling, detail-4 anode, and detail-5 holder intact.
- (4) Load shaft by threading rear end first into bottom of detail-9 locator, locating on threaded ID. (See figure 12.)
- (5) Secure in place by tightening detail-10 screws two places.
- (6) Mask exposed surfaces of anodes.



**Figure 12. SAALC 8041562 Plating Fixture - Application**

**NOTE**

Plating of rear end surface only can be accomplished as indicated above, except details-3, -4, and -5 should not be installed.

- (7) Install details-3, -4, and -5 again and secure with detail-7 thumb screw.
- (8) Dip fixture with part in hot wax as required.
- (9) Remove masking material from fixture and surfaces of part to be plated.

- (10) Chromium plate seal seats. Omit bake cycle. Refer to T.O. 2J-F100-53-1, SWP 092 06, (SPOP 22).

- e. Finish machine seal seats to dimensions shown.
- f. Inspect shaft using magnetic particle inspection procedure. Refer to T.O. 2J-F100-9. No cracks permitted.
- g. Mark part with beehive symbol using shallow etch. Refer to T.O. 2J-F100-53-1, SWP 023 02, (SPOP 401).

# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARSHAFT, BEVEL, GEARBOX -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 5	0	6 Blank	0		

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Plating, Chromium, on Steel, Nickel, or Cobalt	
(SPOP 22) - - - - -	SWP 092 06

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

## 1. INTRODUCTION.

- a. This work package contains instructions for repairing gearbox bevel gearshaft.

- b. Break all sharp edges.

## 2. GEARBOX BEVEL GEARSHAFT - GEARTEETH REPAIR.

(See Figure 1.)



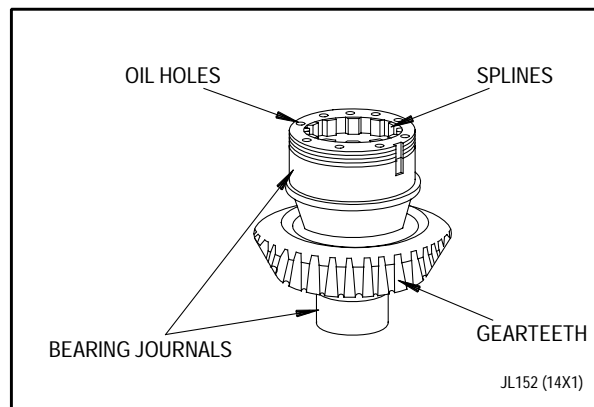
Do not attempt to remove all damage. Do not polish repaired area.

- a. Repair minor surface damage by stoning high spots. (See figure 1.)

## 3. GEARBOX BEVEL GEARSHAFT - OIL HOLE REPAIR.

(See figure 1.)

- a. Remove obstruction from blocked oil hole. (See figure 1.)



**Figure 1. Gearbox Bevel Gearshaft - Repair**

#### 4. GEARBOX BEVEL GEARSHAFT - BEARING JOURNAL REPAIR.

(See figure 1 and Figure 2.)

##### NOTE

Before finish machining, 0.010 maximum bearing journal chromium plating thickness is allowed. After machining, 0.0025 inch minimum and 0.0075 inch maximum chromium plate must remain on journal surface. Machine only to clean up galling, scratches, and previous plating. (Example: bearing journal requirement is 1.3780 to 1.3784 inch diameter; journal cleanup machining is 1.3634 to 1.3730 inch diameter; plating is 0.020 inch (0.010 inch on a side) maximum over cleaned up diameter.

- a. Machine bearing journals to dimensions shown to clean up galling, scratches, and previous plate. Remove only material required to eliminate surface damage or previous plating.
- b. Mask areas not to be plated.

##### Legend for figure 2



Part has carburized areas and must be shotpeened. Do not bake.

##### NOTE

Part is made of AMS 6265 steel and has Rockwell hardness of A81 to 85 or equivalent.

1. Circular runout must be within 0.0002 inch FIR in relation to Diameters A and B.
2. Chromium plate area
3. 0.040 to 0.055 inch
4. 0.039 to 0.054 inch
5. Chromium plate area
6. Chamfer 0.030 to 0.050 inch x 45° ±5°
7. Clean up machine 1.3634 to 1.3730 inch diameter. Finish machine 1.3780 to 1.3784 inch diameter.
8. Circular runout must be within 0.0002 inch FIR in relation to Diameters A and B.
9. Chamfer 0.020 to 0.040 inch x 45° ±5°
10. Slot (two each). Ensure slots are thoroughly masked.
11. Clean up machine 2.5453 to 2.5548 inch diameter. Finish machine 2.5598 to 2.5603 inch diameter.

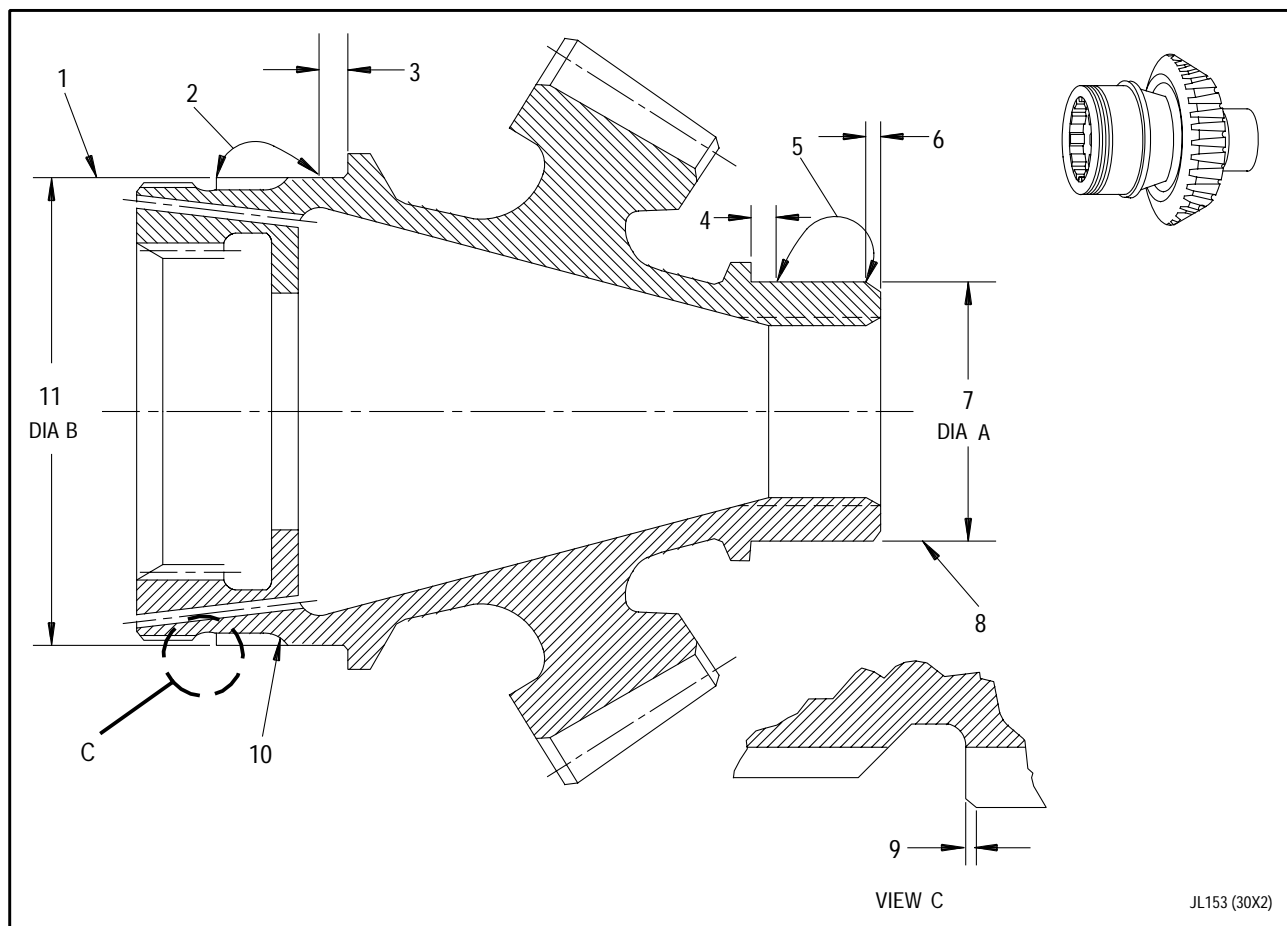


Figure 2. Gearbox Bevel Gearshaft - Plating Repair



Do not bake after plating.

- c. Chromium plate to 0.020 inch (0.010 inch on a side) maximum over actual cleaned up diameter. Refer to T.O. 2J-F100-53-1, SWP 092 06, (SPOP 22).
- d. Finish machine plated area to dimensions shown.

#### 5. GEARBOX BEVEL GEARSHAFT - REPAIR OF OTHER AREAS.

(See figure 1.)

- a. Blend out minor nicks, dents, and scratches, removing minimum material necessary.
- b. Polish to smoothness of original finish.





# WORK PACKAGE

## TECHNICAL PROCEDURES

GEAR, SPUR, GEARBOX (GEARBOX DRIVE SPUR BEVEL GEARSHAFT) -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0	4	Blank	0	

**T.O. 2J-F100-53-11**

**WP 419 00**

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

**1. INTRODUCTION.**

- a. This work package contains instructions for repairing gearbox spur (gearbox drive spur bevel gearshaft).

**2. GEARBOX SPUR GEAR (GEARBOX DRIVE SPUR BEVEL GEARSHAFT) TEETH - REPAIR.**

(See Figure 1.)



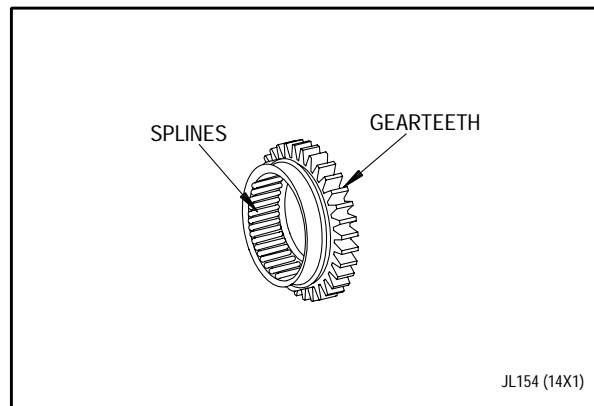
Do not attempt to remove all damage. Do not polish repairs.

- a. Repair minor surface damage by stoning high spots. (See figure 1.)
- b. Break all sharp edges.

**3. GEARBOX SPUR GEAR (GEARBOX DRIVE SPUR BEVEL GEARSHAFT) - REPAIR OF OTHER AREAS.**

(See figure 1.)

- a. Blend out minor nicks, dents, and scratches, removing minimum material. (See figure 1.)



**Figure 1. Gearbox Spur Gear (Gearbox Drive Spur Bevel Gearshaft) - Repair**



# WORK PACKAGE

## TECHNICAL PROCEDURES

GEAR, SPUR, GEARBOX (GEARBOX IDLER GEARSHAFT) -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 6					0

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Plating, Chromium, on Steel, Nickel, or Cobalt (SPOP 22) - - - - -	SWP 092 06
Masking Procedures (SPOP 36) - - - - -	SWP 092 12

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

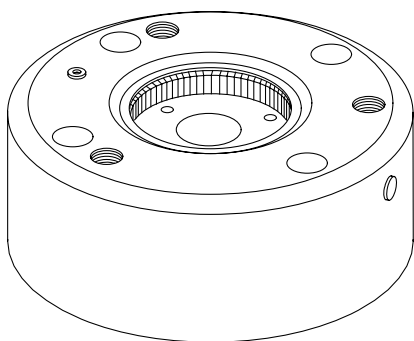
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

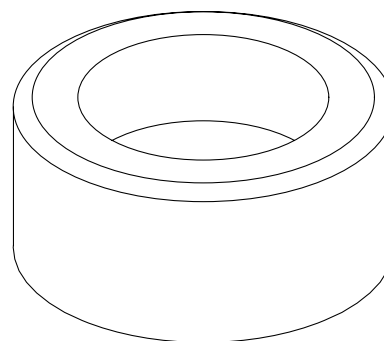
Paragraph	Function - Tool Number	Tool Number
4	Gearbox Spur Gear (Gearbox Idler Gearshaft) - Bearing Journal Repair	
	Chuck, Hydraulic - - - - -	SAALC 8041552
	Ring, Set master - - - - -	SAALC 8041553
	Fixture, Plating - - - - -	SAALC 8041554

ILLUSTRATED SUPPORT EQUIPMENT



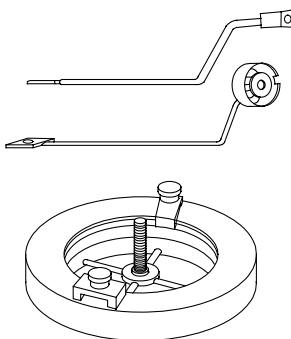
SAALC 8041552 -C

**Figure T1. SAALC 8041552 Chuck**



SAALC 8041553 -C

**Figure T2. SAALC 8041553 Ring**



SAALC 8041554 -C

**Figure T3. SAALC 8041554 Fixture**

## 1. INTRODUCTION.

- a. This work package contains instructions for repairing gearbox spur gear.

## 2. GEARBOX SPUR GEAR (GEARBOX IDLER GEARSHAFT) - GEARTEETH REPAIR.

(See Figure 1.)



Do not attempt to remove all damage. Do not polish repairs.

- a. Repair minor surface damage by stoning high spots. (See figure 1.)
- b. Break all sharp edges.

## 3. GEARBOX SPUR GEAR (GEARBOX IDLER GEARSHAFT) - REPAIR OF OTHER AREAS.

(See figure 1.)

- a. Blend out minor nicks, dents, and scratches. Remove minimum material. (See figure 1.)

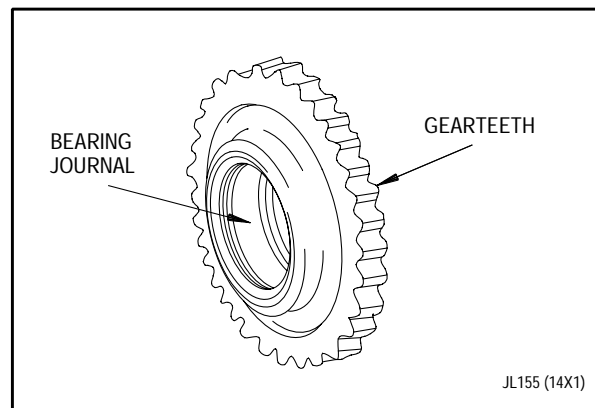


Figure 1. Gearbox Spur Gear (Gearbox Idler Gearshaft) - Repair



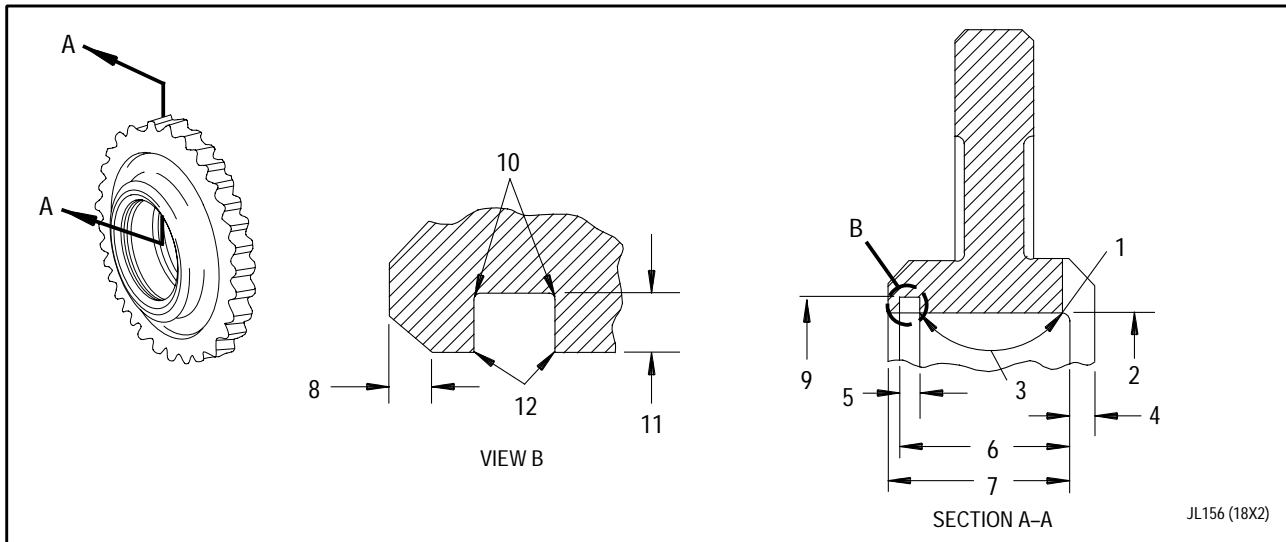
**4. GEARBOX SPUR GEAR (GEARBOX IDLER GEARSHAFT) - BEARING JOURNAL REPAIR.**

(See Figure 2.)

**NOTE**

Before finish machining, 0.010 inch maximum bearing journal chromium plating thickness is allowed. After machining, 0.0025 inch minimum and 0.0075 inch maximum chromium plate shall remain on journal surface. Machine only to clean up galling, scratches, or previous plating. (Example: bearing journal requirement is 1.8493 to 1.8501 inch diameter; journal cleanup machining is 1.8551 to 1.8643 inch diameter; plating is 0.020 inch (0.010 inch on a side) maximum over cleaned up diameter.)

- a. Using SAALC 8041553 ring set and SAALC 8041552 hydraulic chuck, machine bearing journals to dimensions shown to clean up galling, scratches, and previous plating. Remove only material required to eliminate surface damage or previous plating.
- b. Mask areas not to be plated. Refer to T.O. 2J-F100-53-1, SWP 092 12, (SPOP 36).
- c. Using SAALC 8041554 fixture, chromium plate to 0.020 inch (0.010 inch on a side) maximum over actual cleaned up diameter. Refer to T.O. 2J-F100-53-1, SWP 092 06, (SPOP 22).
- d. Using SAALC 8041553 ring set and SAALC 8041552 hydraulic chuck, finish machine plated area to dimensions shown.



1. 0.010 to 0.030 inch radius
2. Clean up machine 1.8551 to 1.8643 inch diameter. Finish machine 1.8493 to 1.8501 inch diameter, after chromium plate.
3. Chromium plate area. See text.
4. 0.070 to 0.090 inch
5. 0.062 to 0.072 inch
6. 0.539 to 0.541 inch
7. 0.600 to 0.610 inch
8. Chamfer 0.015 to 0.030 inch by  $45^\circ \pm 5^\circ$
9. 1.957 to 1.967 inch diameter
10. 0.003 to 0.010 inch radius
11. 0.051 inch minimum
12. Break sharp edge 0.005 inch minimum.

**Figure 2. Gearbox Spur Gear (Gearbox Idler Gearshaft) - Bearing Journal Repair**

# WORK PACKAGE

## TECHNICAL PROCEDURES

GEAR, SPUR, GEARBOX (DEAERATOR IMPELLER SHAFT) -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0	4	Blank	0	

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

**1. INTRODUCTION.**

- a. This work package contains instructions for repairing gearbox spur gear (deaerator impeller shaft).

**2. GEARBOX SPUR GEAR (DEAERATOR IMPELLER SHAFT) - GEAR TEETH REPAIR.**

(See Figure 1.)



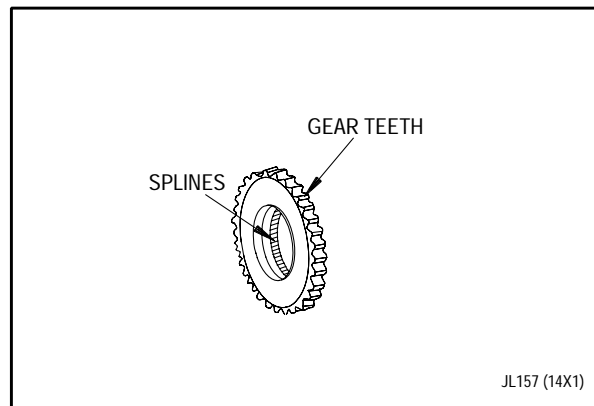
Do not attempt to remove all damage. Do not polish repairs.

- a. Repair minor surface damage by stoning high spots. (See figure 1.)
- b. Break all sharp edges.

**3. GEARBOX SPUR GEAR (DEAERATOR IMPELLER SHAFT) - REPAIR OF OTHER AREAS.**

(See figure 1.)

- a. Blend out minor nicks, dents, and scratches, removing minimum material. (See figure 1.)



**Figure 1. Gearbox Spur Gear (Deaerator Impeller Shaft) - Gear Teeth Repair**



**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**IMPELLER, GEARBOX DEAERATOR -**

**REPAIR**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 4

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 4 . . . . .					0

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Chromium Plate, Inspection - - - - -	SWP 092 02
Plating, Chromium, on Steel, Nickel, or Cobalt	
(SPOP 22) - - - - -	SWP 092 06

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
3	Gearbox Deaerator Impeller - Mating Face Repair	
	Fixture, Machining, gearbox deaerator impeller - - - - -	SAALC X7744811

ILLUSTRATED SUPPORT EQUIPMENT

None



**1. INTRODUCTION.**

- a. This work package contains instructions for repair of gearbox deaerator impeller.

**2. GEARBOX DEAERATOR IMPELLER - BLEND REPAIR.**

- a. Blend out minor damage carefully, removing a minimum amount of material.

### 3. GEARBOX DEAERATOR IMPELLER - MATING FACE REPAIR.

(See Figure 1.)

#### NOTE

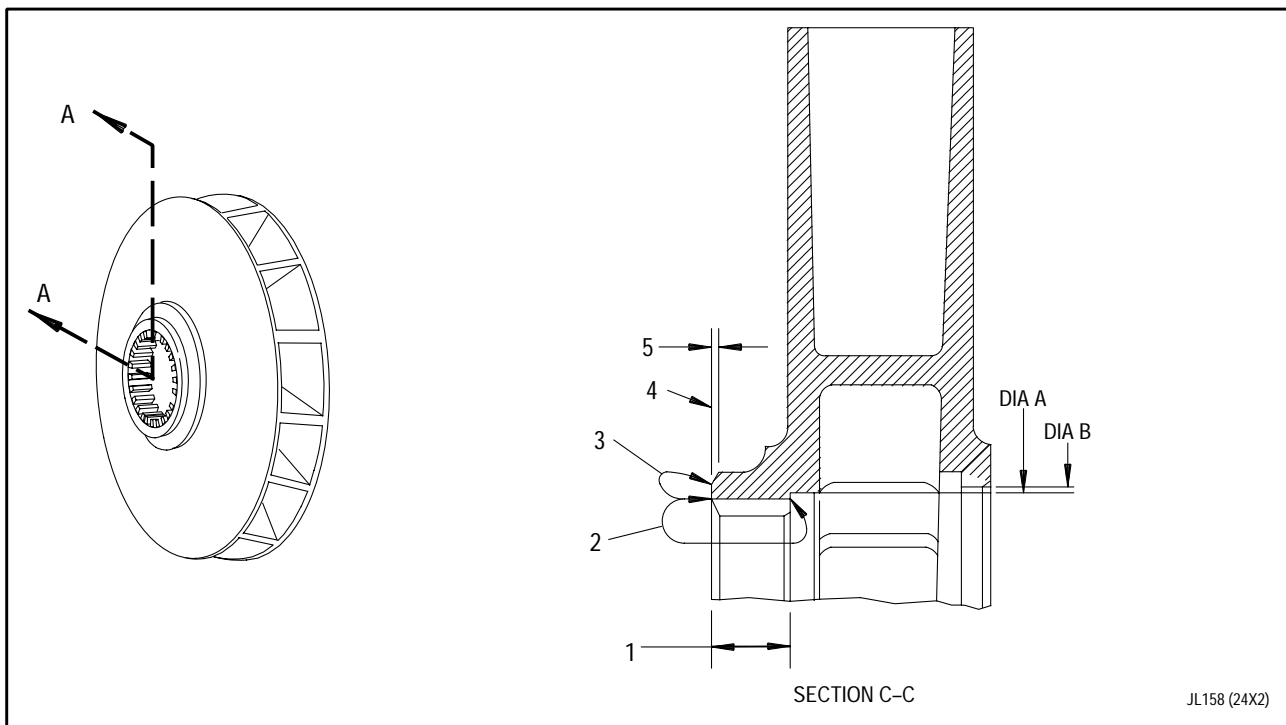
Parent material is AMS 5350  
stainless steel.

a. Machine to clean up to dimension  
shown. Use SAALC manufactured  
X7744811 grinding fixture.

b. Chromium plate. Refer to  
AMS 2406. Refer to  
T.O. 2J-F100-53-1, SWP 092 02  
and 092 06, (SPOP 22).

c. Finish machine plated area to  
dimensions shown, using  
SAALC X7744811 grinding fixture.

d. Break edges of plated surfaces  
0.005 to 0.010 inch.



1. Clean up machine 0.3740 to 0.3765 inch. Chromium plate to 0.386 inch minimum. Finish machine 0.379 to 0.381 inch.
2. No plating is permitted.
3. Chromium plate. Refer to text. Plating outside enclosed area is permissible, but excess shall be subsequently removed.
4. This surface shall be flat within 0.001 inch total. Circular runout shall be within 0.001 inch FIR when part is mounted on Diameters A and B.
5. Restore chamfer 0.030 to 0.050 inch x 45° ±5°, if required.

**Figure 1. Gearbox Deaerator Impeller - Mating Face Repair**

# WORK PACKAGE

## TECHNICAL PROCEDURES

### COVER ASSEMBLY, GEARBOX UPPER -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 7 . . . . .	0				
8 Blank . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O. 2-1-111
Nondestructive Inspection - - - - -	T.O. 2J-F100-9
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Hard Coating, Aluminum (AMS 2468)	
(SPOP 39) - - - - -	SWP 092 13
Anodize Touch-up, Brush or Swab (AMS 2473)	
(SPOP 42) - - - - -	SWP 092 16

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

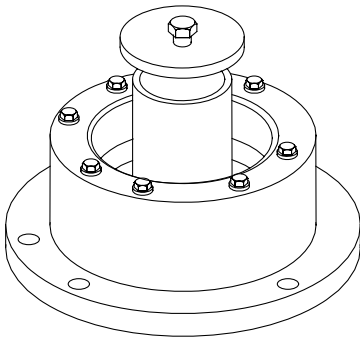
EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Helical coil insert	MS124736	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
3	Gearbox Upper Cover Assembly - Snap Diameter Repair	
	Fixture, Machining, Gearbox Cover Assy Front/Rear	SAALC 7745098

ILLUSTRATED SUPPORT EQUIPMENT



SAALC 7745098 -C

Figure T1. SAALC 7745098 Fixture

**1. INTRODUCTION.**

- a. This work package contains instructions for repair of gearbox upper cover assembly.

**2. GEARBOX UPPER COVER ASSEMBLY -  
HELICAL COIL INSERT REPLACEMENT.**

- a. Remove damaged helical coil insert using Heli-Coil extractor tool No. 1227-6.

- b. Install new PN MS124736 insert using Heli-Coil No. 7552-4 inserting tool.

**NOTE**

Insert 1.0 to 1.5 pitch below surface.

- c. Break off tang at notch using Heli-Coil No. 3695-4 tool.

**3. GEARBOX UPPER COVER ASSEMBLY -  
SNAP DIAMETER REPAIR.**



(See Figure 1.)

- a. Diameters worn within following limits and which do not require clean up machining may be repaired by hardcoating. Refer to step b. Other diameters shall be repaired. Refer to step c. (See figure 1.)

Diameter A: 6.019 inch diameter  
maximum

Diameter D: 6.295 inch diameter  
minimum

Diameter E: 4.366 inch diameter  
maximum

Diameter F: 2.838 inch diameter  
maximum

- b. Repair diameters within limits specified by step a. shall be repaired as follows:
  - (1) Hardcoat areas shown. Refer to AMS 2468 and to T.O. 2J-F100-53-1, SWP 092 13 (SPOP 39).
  - (2) Grind to dimension shown for finish machining as follows:
    - (a) Install SAALC 7745098 fixture on machining table, flanged end down. Center fixture using upper ID and secure.

Excess pressure will damage case assembly. Do not overtighten nuts and clamps.

Imperfections on locating diameters and surfaces on base and cover may cause incorrect machining. These surfaces shall be kept clean.

- (b) To machine Diameter A or E, remove center post locator from fixture and install gearbox cover, small end down. If necessary, tap cover using phenolic or rawhide mallet to ensure proper contact between fixture and cover. Secure cover to fixture using eight screws.

- (c) To machine Diameter F, remove center post locator from fixture and install gearbox cover, small end up. Secure cover to fixture using eight screws.

- (d) To machine Diameter D, install center post locator in fixture and secure using three screws. Install gearbox cover, small end up, into fixture and secure using clamp and hex head cap screws.

- (e) Finish machine to dimensions specified. (See figure 1.) Remove cover from fixture.

- (3) If applicable, touch-up anodize coating on nonmachined surfaces. Refer to AMS 2473 and to T.O. 2J-F100-53-1, WP 092 16 (SPOP 42).

c. Diameters requiring more extensive repair shall be repaired as follows:

(1) Clean up machine cover assembly as follows:

(a) Set up cover for machining. Refer to steps b.(2)(a) through b.(2)(d).

(b) Clean up machine cover to dimensions shown.

(2) Fluorescent penetrant inspect machined surfaces. Refer to T.O. 2J-F100-9.

(3) Nickel plate to dimensions shown. Refer to AMS 2424 and to T.O. 2-1-111. Bake after plating at  $375^{\circ} \pm 10^{\circ}\text{F}$  ( $191^{\circ} \pm 6^{\circ}\text{C}$ ) for three hours.



Final thickness of nickel plate after finish machining must be 0.002 to 0.011 inch.

(4) Finish machine cover assembly as follows:

(a) Set up cover for machining. Refer to steps b.(2)(a) through b.(2)(d).

(b) Clean up machine cover to dimensions shown.

(5) If applicable touch-up anodize coating on nonmachined surfaces. Refer to AMS 2473 and to T.O. 2J-F100-53-1, SWP 092 16 (SPOP 42).

#### 4. GEARBOX UPPER COVER ASSEMBLY - MOUNTING FLANGE BLEND REPAIR.

(See figure 1.)

a. Blend out raised metal due to galling, removing minimum material. (See figure 1.)

b. Polish to smoothness of original finish.

c. If applicable touch-up anodize coating. Refer to AMS 2473 and to T.O. 2J-F100-53-1, SWP 092 16 (SPOP 42).

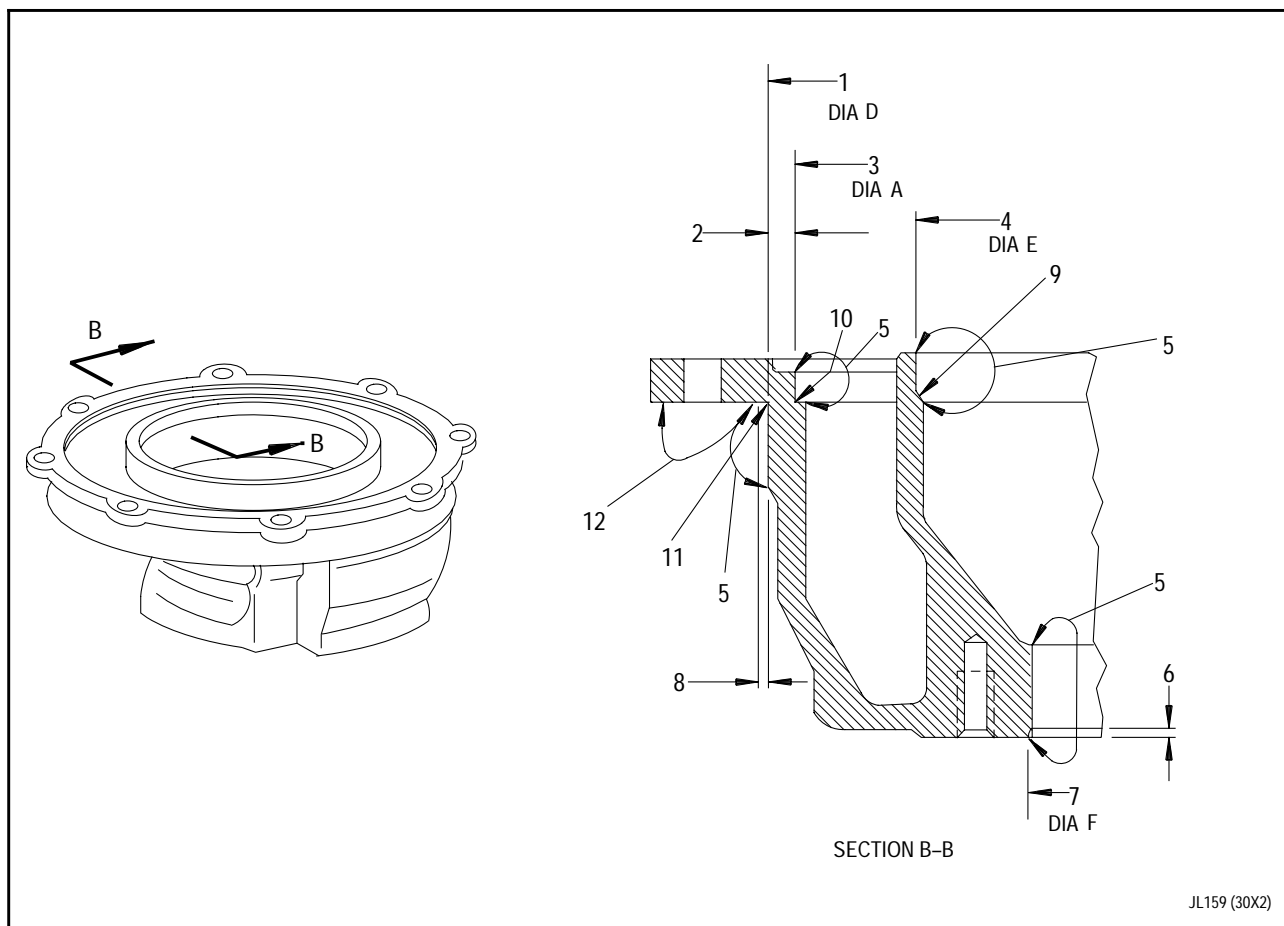


Figure 1. Gearbox Upper Cover Assembly - Snap Diameter Repair



**Legend for figure 1**

1. Clean up machine 6.278 to 6.292 inch diameter, hold to maximum value. Nickel plate to 6.309 inch diameter maximum. Finish machine 6.298 to 6.299 inch diameter.
2. 0.131 inch minimum parent metal wall before plate of OD and ID.
3. Clean up machine 6.022 to 6.036 inch diameter, hold to minimum value. Nickel plate to 6.005 inch diameter maximum. Finish machine 6.015 to 6.016 inch diameter. This diameter shall be concentric with Diameter D within 0.001 inch FIR.
4. Clean up machine 4.369 to 4.379 inch diameter, hold to minimum value. Nickel plate to 4.347 inch diameter maximum. Finish machine 4.357 to 4.363 inch diameter. This diameter shall be concentric with Diameter A within 0.002 inch FIR.
5. All diameters nonconforming by 0.003 inch or less may be repaired by hardcoating enclosed area. Refer to AMS 2468. If wear exceeds this amount diameter must be machined to clean up and nickel plated. Plating outside enclosed area is permissible, but such excess plate must be removed.
6. Chamfer 0.050 to 0.070 inch x 45° ±2°.
7. Clean up machine 2.841 to 2.855 inch diameter, hold to minimum value. Nickel plate to 2.824 inch diameter maximum. Finish machine 2.8346 to 2.8350 inch diameter. This diameter must be concentric with Diameter D within 0.001 inch FIR.
8. 0.015 to 0.030 inch
9. 0.109 to 0.141 inch radius
10. 0.047 to 0.078 inch radius
11. 0.005 to 0.015 inch radius
12. Mounting flange bottom side. Blend out raised metal due to galling, and scratches up to 0.010 inch deep.



# WORK PACKAGE

## TECHNICAL PROCEDURES

TUBE, TRANSFER, GEARBOX BEARING -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0	4	Blank	0	

**T.O. 2J-F100-53-11**

**WP 429 00**

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

None

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None

**1. INTRODUCTION.**

- a. This work package contains instructions for repair of gearbox bearing transfer tube.

**2. GEARBOX BEARING TRANSFER TUBE - REPAIR.**

- a. Blend out minor nicks, dents, and scratches. Remove minimum material.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### BAFFLE ASSEMBLY, GEARBOX -

#### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3 . . . . .	0				
4 Blank . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Anodize Touch-Up, Brush or Swab (AMS 2473)	
(SPOP 42) - - - - -	SWP 092 16

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None



## 1. INTRODUCTION.

- a. This work package contains instructions for repairing gearbox baffle assembly.

- b. Coat exposed aluminum. Refer to T.O. 2J-F100-53-1, SWP 092 16 (SPOP 42).

## 2. GEARBOX BAFFLE ASSEMBLY - SCRATCH AND NICK REPAIR. (See Figure 1.)

- a. Blend raised metal flush to within 0.005 inch of original surface. (See figure 1.)

## 3. GEARBOX BAFFLE ASSEMBLY - GALLING REPAIR.

- a. Polish galled area flush to original surface.
- b. Coat exposed aluminum. Refer to T.O. 2J-F100-53-1, SWP 092 16 (SPOP 42).

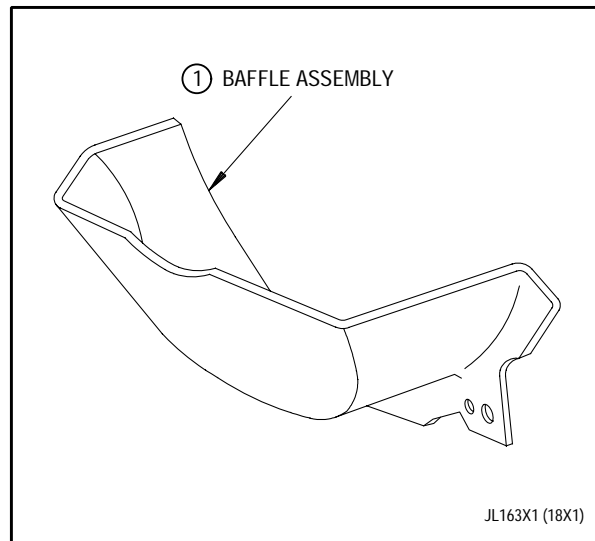


Figure 1. Gearbox Baffle Assembly - Repair



# WORK PACKAGE

## TECHNICAL PROCEDURES

### COUPLING, REMOTE GEARBOX DRIVESHAFT -

### REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 8					0

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Plating, Nickel-Cadmium (SPOP 25) - - - - -	SWP 092 09
Plating, Nickel, On Steel (SPOP 29) - - - - -	SWP 092 11

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

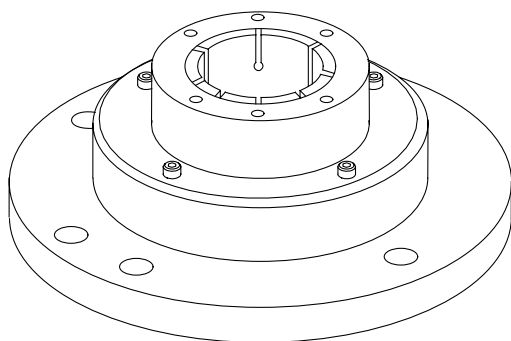
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

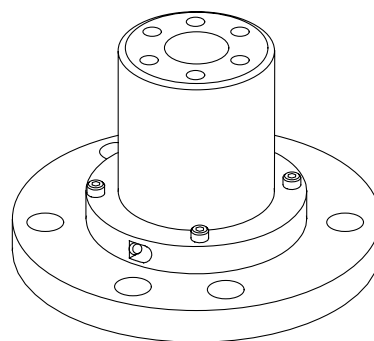
Paragraph	Function - Tool Nomenclature	Tool Number
2	Remote Gearbox Driveshaft Coupling (PN 4067185) - Plating	
	Fixture, machine - - - - -	SAALC 7836903
	Fixture, machine - - - - -	SAALC 7836904
	Ring, set master - - - - -	SAALC 8041518
	Plug, set master - - - - -	SAALC 8041519
	Fixture, plating - - - - -	SAALC 8041520

ILLUSTRATED SUPPORT EQUIPMENT



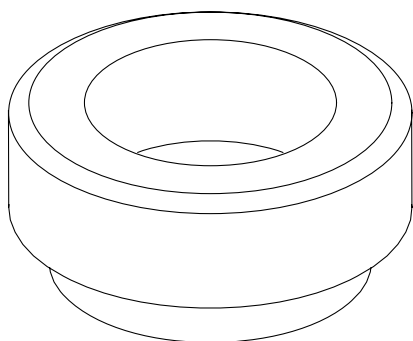
SAALC 7836903 -C

**Figure T1. SAALC 7836903 Fixture**



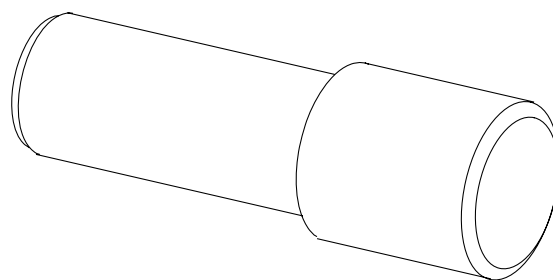
SAALC 7836904 -C

**Figure T2. SAALC 7836904 Fixture**



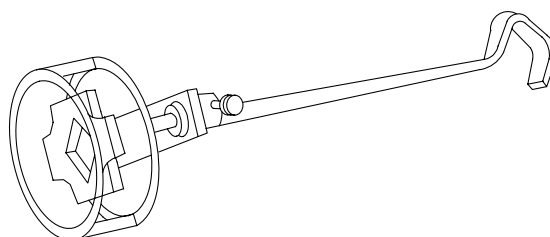
SAALC 8041518 -C

**Figure T3. SAALC 8041518 Ring**



SAALC 8041519 -C

**Figure T4. SAALC 8041519 Plug**



SAALC 8041520 -C

**Figure T5. SAALC 8041520 Fixture**

## 1. INTRODUCTION.

- a. This work package contains instructions for plating repair and blend repair of remote gearbox driveshaft coupling.

## 2. REMOTE GEARBOX DRIVESHAFT COUPLING - PLATING REPAIR.

(See Figures 1 and 2.)

- a. Set up equipment to repair Diameter A as follows:

- (1) Position SAALC 7836903 machining fixture on machine table. (See figure 1.)
- (2) Centralize fixture by taking runout on 4.7498 inch locating diameter and secure fixture to table.
- (3) Install chuck in fixture and secure with screws.
- (4) Install SAALC 8041518 set master ring in locating diameter of fixture and secure in place on the 2.37475  $\pm$ 0.00025 inch diameter.
- (5) Take runout on 2.8 OD of ring to centralize fixture on table.
- (6) Secure centered fixture in place on table, deactivate chuck and remove ring.

- (7) Install coupling with flanged end down on fixture. Make certain part is properly positioned in chuck and actuate chuck to secure coupling to fixture.

- (8) Grind surface on Diameter A. (See figure 2.)

- (9) Deactivate chuck, remove coupling from fixture.

- (10) Tag part with machined dimension and send to plating section.

- b. Set up equipment to repair Diameter J as follows:

- (1) Position SAALC 7836904 machine fixture on machine table.
- (2) Centralize fixture by taking runout on 2.9998 locating diameter and secure fixture to table.
- (3) Install chuck in fixture and secure with screws.
- (4) Install SAALC 8041519 set master plug in locating diameter of fixture and secure in place on 1.37225  $\pm$ 0.00025 inch diameter.

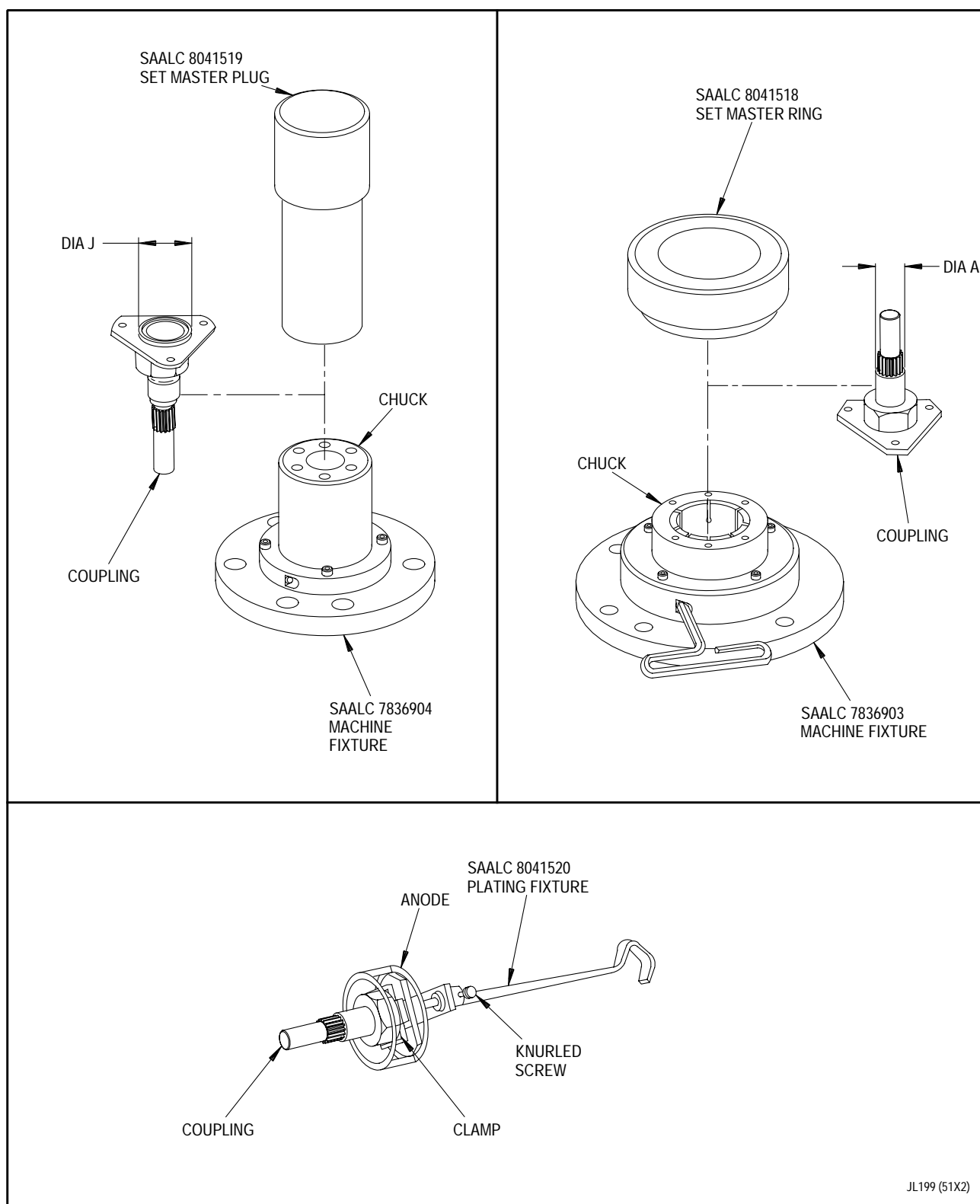


Figure 1. Remote Gearbox Driveshaft Coupling With Machining and Plating Equipment

- (5) Take runout on  
1.37225  $\pm$ 0.00025 inch OD on  
plug to centralize fixture  
on table. Secure fixture to  
table, deactivate chuck and  
remove plug.
- (6) Install coupling with  
flanged end up into fixture  
chuck. Make certain part is  
properly positioned in  
chuck. Actuate chuck to  
secure coupling to the  
fixture.
- (7) Grind surface on Diameter J.  
(See figure 2.)
- (8) Remove coupling from fixture  
tag part with machined  
dimension and send to  
plating section.

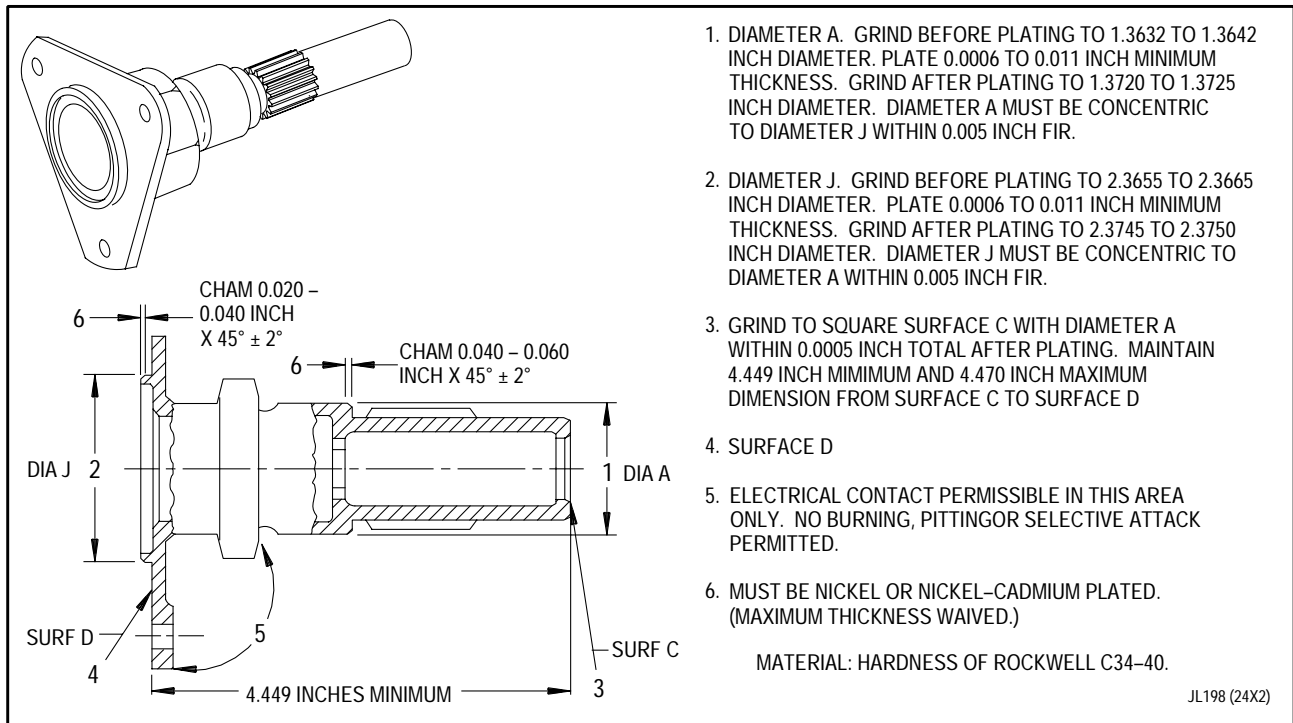


Three boltholes in flange are  
nickel plated. Ensure they are  
masked to prevent inadvertent  
stripping of nickel.

- c. Strip nickel-cadmium plating.  
Refer to T.O. 2J-F100-53-1,  
SWP 092 09 (SPOP 25).
- d. Set up plating equipment to  
nickel plate Diameter A and/or J  
as follows: (See figure 1.)

- (1) Prepare coupling for nickel  
plating surface area. Refer  
to T.O. 2J-F100-53-1,  
SWP 092 11 (SPOP 29).
  - (2) Remove anode assembly from  
SAALC 8041520 plating  
fixture by loosening knurled  
head screw.
  - (3) Remove screws securing clamp  
and remove clamp half.
  - (4) Install coupling in fixture  
so that coupling is secured  
to fixture by clamp in area  
between coupling flange and  
hex with clamp screws.
  - (5) Hot wax dip fixture/port  
assembly as required.
  - (6) Remove masking material from  
surfaces to be plated.
  - (7) Install anode assembly.
- e. Nickel plate Diameter A (1) and  
Diameter J (2). Refer to  
T.O. 2J-F100-53-1, SWP 092 11  
(SPOP 29)





**Figure 2. Remote Gearbox Driveshaft Coupling - Plating Repair**

- f. Nickel-cadmium plate entire coupling except Diameters A and J. Refer to T.O. 2J-F100-53-1, SWP 092 11 (SPOP 29).
- g. Bake at 620° to 640°F (327° to 338°C) for one hour minimum.

**NOTE**

Diameters A and J shall be concentric within 0.0005 inch FIR.

- h. Using SAALC 7836903 or SAALC 7836904 machine fixture, finish grind Diameters A and J. (See figure 2.)

**3. REMOTE GEARBOX DRIVESHAFT  
COUPLING - SQUARE END FACE REPAIR.**

(See figure 2.)

- a. Grind to square Surface C(3) with Diameter A(1) within 0.0005 inch total after plating. Maintain 4.449 inch minimum and 4.470 inch maximum dimension from Surface C(3) to Surface D(4). (See figure 2.)

**4. REMOTE GEARBOX DRIVESHAFT  
COUPLING - BLEND REPAIR.**

- a. Blend any pits, dents, and nicks on splines of remote gearbox driveshaft coupling to a maximum depth limit of 0.007 inch, after removal of raised metal.
- b. Replace coupling if damage cannot be repaired without affecting spline.
- c. For all other areas where nicks, scratches, gouges, and corrosion occur, remove high spots. Polish to smoothness of original finish. Maximum reparable depth limit is 0.008 inch.

# WORK PACKAGE

## INTRODUCTION

### GEARBOX MODULE - ASSEMBLY OF SUBASSEMBLIES

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2					
					0

**1. INTRODUCTION.**

This work package introduces the 600 00 through 699 00 series of work packages for the gearbox module assembly of subassemblies. The following work packages are included in this series.

<b>WP No.</b>	<b>Title</b>
601 00	Seal Assemblies, Face - Installation in Retainers
602 00	Shaft, Gearbox Deaerator Impeller - Assembly
603 00	Gearshaft Assembly, Bevel, Spur, Gearbox Drive - Assembly
604 00	Gearshaft, Spur, Gearbox - Assembly
605 00	Cover, Upper, Gearbox - Gearshaft, Bevel, Gearbox - Assembly Sleeve, Sealing, Gearbox -
606 00	Reduction Gearbox Assembly - Assembly
607 00	Seal Assembly, Face (Deaerator Impeller Shaft) - Assembly
608 00	Seal Assembly, Face (Gearbox Drive Spur Bevel Gearshaft) - Assembly
609 00 through 699 00	Open

# WORK PACKAGE

## TECHNICAL PROCEDURES

## SEAL ASSEMBLIES, FACE -

## INSTALLATION IN RETAINERS

EFFECTIVITY: ENGINE MODEL F100-PW-229

### LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 6 . . . . .	17	7 Added . . . . .	17	8 Blank Added . . . . .	17

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O. 2-1-111
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Gearbox Module - Table of Limits - - - - -	WP 801 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

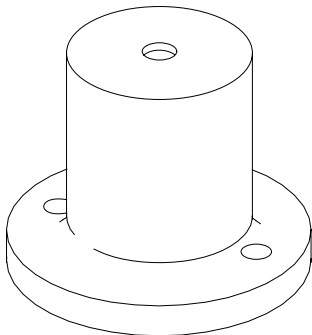
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

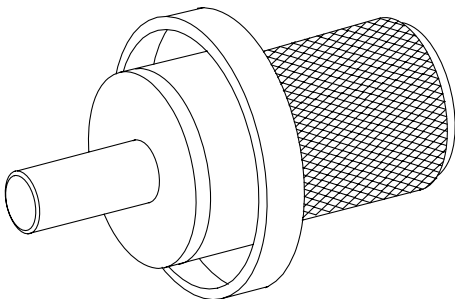
Paragraph	Function - Tool Nomenclature	Tool Number
2	GEARBOX MODULE FACE SEAL ASSEMBLIES - ASSEMBLY	
	BASE, GEARSHAFT SEALS - - - - -	PWA 10631
	GUIDE, SEAL, DEAERATOR IMPELLER GEARBOX INSTALL - -	PWA 56726
		OR
	DRIFT, IGNITION ALTERNATOR DRIVE SHAFT CARBON SEAL, INSTALL - - - - -	PWA 50419
	BASE, REDUCTION GEARBOX SEAL - - - - -	PWA 57053
	DRIFT, REDUCTION GEARBOX SEAL - - - - -	PWA 57052
	BASE, GEARSHAFT SEALS - - - - -	PWA 10631
	DRIFT, FUEL PUMP DRIVESHAFT SEAL - - - - -	PWA 50447
	GUIDE, FACE SEAL, GEARBOX PTO DRIVE SHAFT - - - - -	PWA 56670

ILLUSTRATED SUPPORT EQUIPMENT



PWA 10631 -C

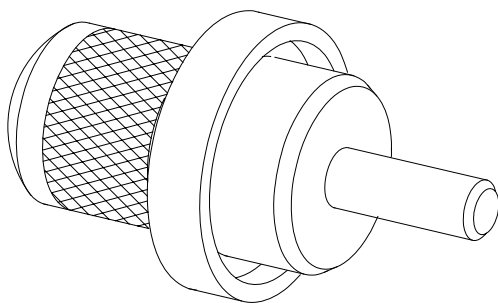
Figure T1. PWA 10631 BASE



PWA 50447 -C

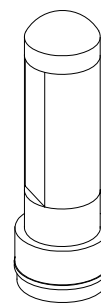
Figure T2. PWA 50447 DRIFT

ILLUSTRATED SUPPORT EQUIPMENT (continued)



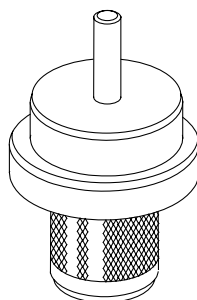
PWA 56670 -C

Figure T3. PWA 56670 GUIDE



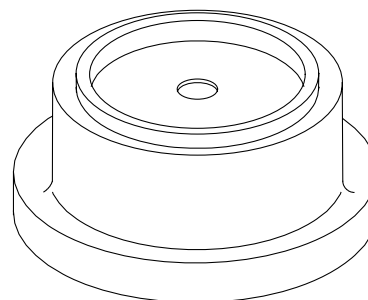
PWA 56726 -C

Figure T4. PWA 56726 GUIDE



PWA 57052 -C

Figure T5. PWA 57052 DRIFT



PWA 57053 -C

Figure T6. PWA 57053 BASE

## 1. INTRODUCTION.

- a. This work package contains instructions for installing face seal assemblies in seal retainers.

## 2. GEARBOX MODULE FACE SEAL ASSEMBLIES - ASSEMBLY.

(See Figures 1 and 2.)

### NOTE

- Proper handling procedures are contained in T.O. 2-1-111.
  - Assembly procedure for deaerator shaft oil seal and retainer assembly is contained in step a.
  - Assembly procedure for reduction gearbox face oil seal and retainer assembly is contained in step b.
  - Assembly procedure for PTO drive gearbox module face seal and retainer assembly is contained in step c.
- a. Assemble deaerator shaft oil seal assembly as follows:

- (1) Check face seal assemblies for proper fits and clearances per WP 801 00, Reference 5332.



- Failure to correctly install face seal may result in face seal damage.
- Use minimum force to seat face seal or damage to carbon seal face will occur.

- (2) Position PWA 10631 base(4, figure 2) on standard 1/2 ton arbor press or equivalent.
- (3) Heat oil seal retainer 375° to 425°F (191° to 218°C) for 15 to 30 minutes.
- (4) Install retainer(3) on PWA 10631 base(4), smaller ID face down.
- (5) Install seal assembly(2) into retainer(3) with carbon seal face down.
- (6) Press seal assembly into retainer, using PWA 56726 guide(1) and standard 1/2 ton arbor press or equivalent.
- (7) Check carbon seal for freedom of movement by pushing on sealing surface by hand. Carbon seal should return to original position without binding or drag.
- (8) Remove assembled face seal and retainer from PWA 10631 base, and place on bench with carbon seal facing up. Ensure face seal is completely seated in oil seal retainer using a 0.001 inch offset feeler gage (stock) at three locations.
- (9) Protect seal assembly to prevent possible damage prior to installing in main gearbox assembly. Refer to T.O. 2-1-111.



b. Assemble the reduction gearbox face seal assembly per figure 1 and as follows:

- (1) Check face seal assembly for proper fits and clearances per WP 801 00, Reference 5389.
- (2) Position PWA 57053 base on standard 1/2 ton arbor press or equivalent.
- (3) Heat oil seal retainer 375° to 425°F (191° to 218°C) for 15 to 30 minutes.
- (4) Deleted.
- (5) Install oil seal retainer on PWA 57053 base, smaller ID face down.
- (6) Install face seal into retainer with carbon seal face down.
- (7) Press face seal to seat using PWA 57052 drift and standard 1/2 ton arbor press or equivalent.



Failure to completely seat ring as specified may result in part damage or oil leakage.

- (8) Install retaining ring in inner diameter groove of oil seal retainer. Ensure that both rings of retaining ring are completely seated in groove of oil seal retainer.
- (9) Check carbon seal for freedom of movement by pushing on sealing surface by hand. Carbon seal should return to original position without binding or drag.
- (9a) Remove PWA 57052 drift and PWA 57053 base.
- (10) Remove assembled face seal and retainer from PWA 57053 base, and place on bench

with carbon seal facing up. Ensure face seal is completely seated in oil seal retainer using a 0.001 inch offset feeler gage (stock) at three locations.

c. Assemble PTO drive gearbox module face seal assembly as follows:

- (1) Check face seal assemblies for proper fits and clearances per WP 801 00, Reference 5331.



- Failure to correctly install face seal may result in face seal damage.
  - Use minimum force to seat face seal or damage to carbon seal face will occur.
- (2) Position PWA 10631 base(4,figure 2) on standard 1/2 ton arbor press or equivalent.
  - (3) Heat oil seal retainer 375° to 425°F (191° to 218°C) for 15 to 30 minutes.
  - (4) Install oil seal retainer on PWA 10631 base, smaller ID face down.
  - (5) Install face seal into retainer with carbon seal face down.
  - (6) Press seal assembly into retainer, using PWA 57670 guide and standard 1/2 ton arbor press or equivalent. See figure 1 for appropriate tool numbers.
  - (7) Check carbon seal for freedom of movement by pushing on sealing surface by hand. Carbon seal should return to original position without binding or drag.

- (8) Remove PWA 56670 guide and PWA 10631 base.
- (9) Remove assembled face seal and retainer from PWA 10631 base, and place on bench with carbon seal facing up. Ensure face seal is completely seated in oil

seal retainer using a 0.001 inch offset feeler gage (stock) at three locations.

- (10) Protect seal assembly to prevent possible damage prior to installing in main gearbox assembly. Refer to T.O. 2-1-111.

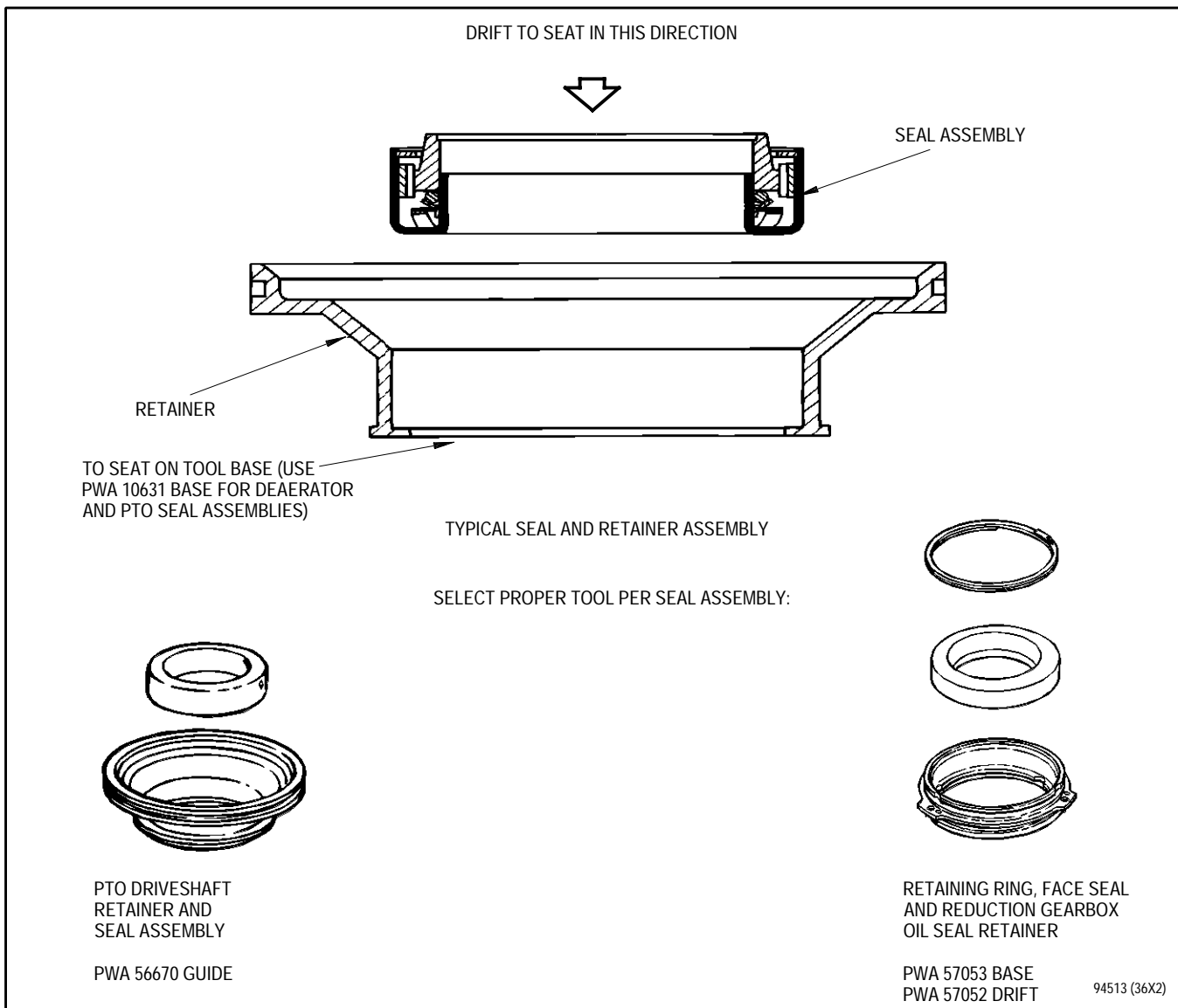
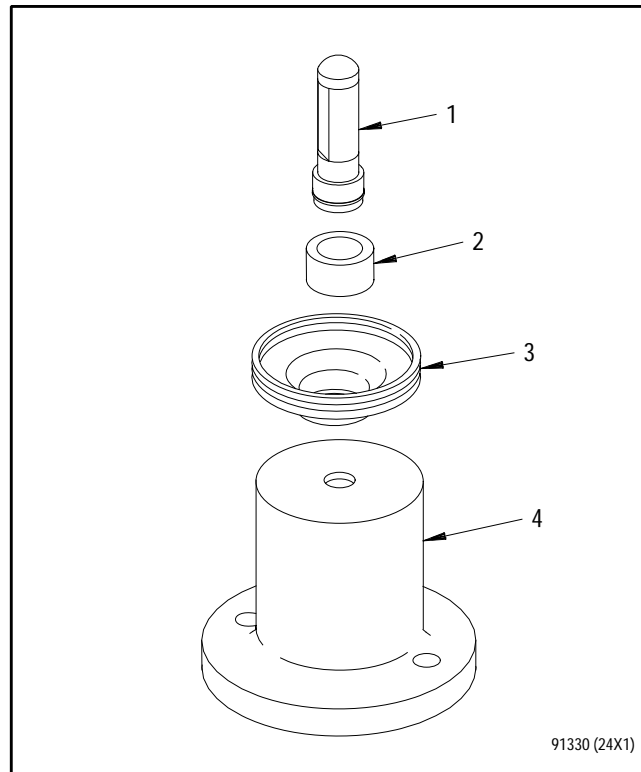


Figure 1. Gearbox Module Face Seal Assemblies - Assembly Tooling



**Figure 2. Deaerator Impeller Gearshaft Seal - Installation**

1. Guide (PWA 56726)
2. Seal Assembly
3. Retainer
4. Base (PWA 10631)



**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**SHAFT, GEARBOX DEAERATOR IMPELLER -**

**ASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 8

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 . . . . .	11	2 - 6 . . . . .	0	7 - 8 . . . . .	11

## REFERENCE MATERIAL REQUIRED

Title	Number
Gearbox Module - - - - -	T.O. 2J-F100-53-1
Table of Limits and Clearance Charts - - - - -	WP 801 00

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Pencil (crayon), silver, metal marking (hard)	Colorbrite No. 2101 or Color-Tex 1843 or Anadel No. 1936

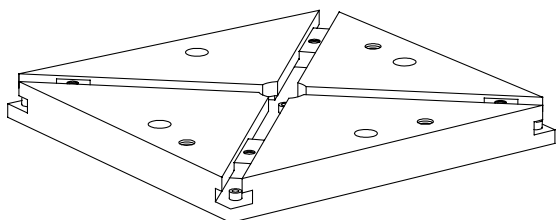
## EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Key washer	4027238	1

## APPLICABLE SUPPORT EQUIPMENT

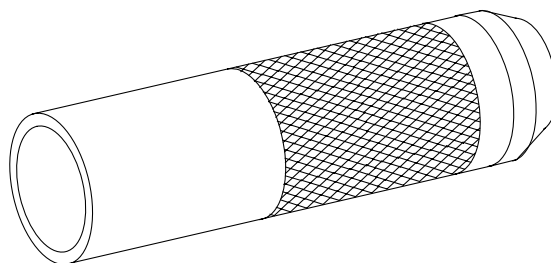
Paragraph	Function - Tool Nomenclature	Tool Number
2	Deaerator Impeller Shaft and Deaerator Impeller - Assembly	
	Adapter, Various bases holding - - - - -	PWA 21500
	Drift, Deaerator impeller shaft deaerator - - - - -	PWA 50401
	Drift, Deaerator impeller shaft gear - -	PWA 50402
	Wrench, Deaerator impeller shaft ball and roller bearings retaining nut - - - - -	PWA 50407
	Base, Deaerator impeller shaft - - - - -	PWA 50616
	Base - - - - -	PWA 50648
	Wrench, Deaerator impeller shaft ball and roller bearings retaining nut - - - - -	PWA 55824

ILLUSTRATED SUPPORT EQUIPMENT



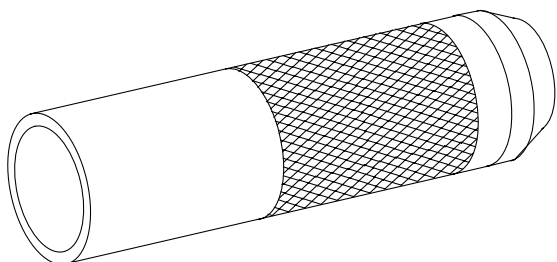
PWA 21500 -C

**Figure T1. PWA 21500 Adapter**



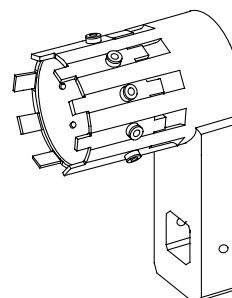
PWA 50401 -C

**Figure T2. PWA 50401 Drift**



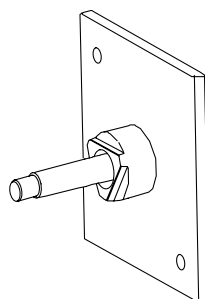
PWA 50402 -C

**Figure T3. PWA 50402 Drift**



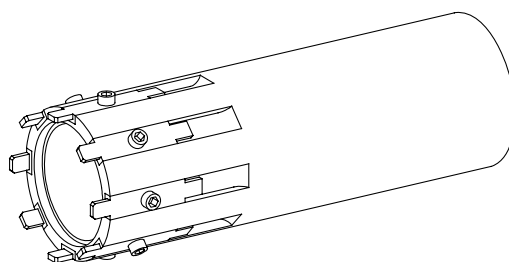
PWA 50407 -C

**Figure T4. PWA 50407 Wrench**



PWA 50616 -C

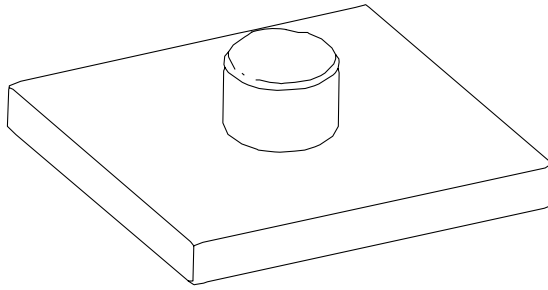
**Figure T5. PWA 50616 Base**



PWA 55824 -C

**Figure T6. PWA 55824 Wrench**

**ILLUSTRATED SUPPORT EQUIPMENT**



PWA 50648 -C

**Figure T7. PWA 50648 Base**



## 1. INTRODUCTION.

- a. This work package contains instructions for assembly of gearbox deaerator impeller shaft, gearbox deaerator impeller, and spur gear details. The bearing for this assembly is not installed on the shaft at this time, but instead is installed during assembly of the rear gearbox housing.

## 2. DEAERATOR IMPELLER SHAFT AND DEAERATOR IMPELLER - ASSEMBLY.

(See Figures 1 and 2.)

- a. Comply with step b. if using PWA 50616 base, comply with step c. if using PWA 50648 base.
- b. Install deaerator impeller shaft(6, figure 1) using PWA 50616 base as follows:
  - (1) Install deaerator impeller shaft(6), large OD down on PWA 50616 base so flats of shaft engage flats of tool.
  - (2) Ensure sealing surfaces are not scratched. (See figure 2.)
  - (3) Heat deaerator impeller(5, figure 1) in hot oil tank.
  - (4) Install deaerator impeller(5) large ID down, spline end up, on shaft(6).
  - (5) Seat deaerator impeller(5) using PWA 50401 drift and standard arbor press.

- c. Install deaerator impeller shaft(6) using PWA 50648 base as follows:

- (1) Heat deaerator impeller(5) in hot oil tank.
- (2) Ensure sealing surfaces are not scratched. (See figure 2.)
- (3) Place PWA 50648 base on standard arbor press.
- (4) Install deaerator impeller(5, figure 6) large ID down, spline end up, on shaft(6).
- (5) Place deaerator impeller assembly on PWA 50648 base.
- (6) Seat deaerator impeller(5) using PWA 50401 drift and standard arbor press.

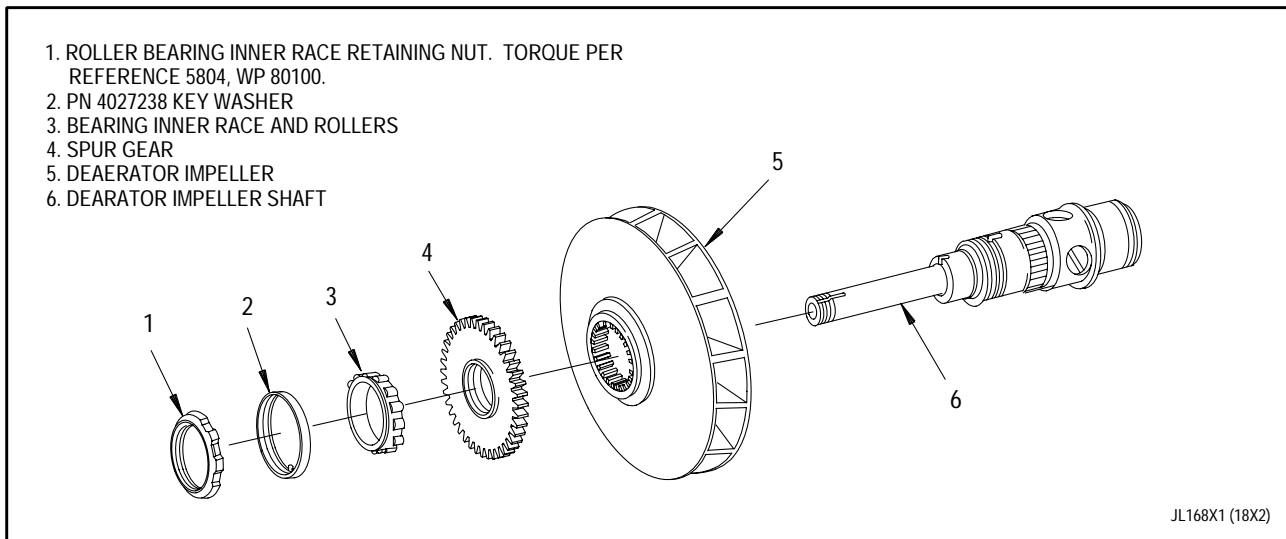
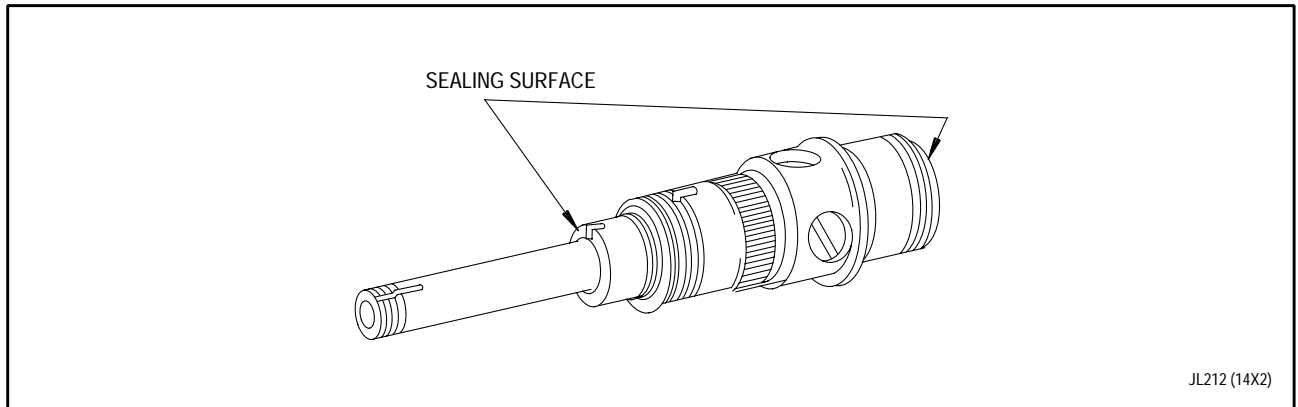


Figure 1. Deaerator Impeller Shaft and Deaerator Impeller and Spur Gear Assembly - Assembly



**Figure 2. Deaerator Impeller Shaft Sealing Surfaces**

- d. Install spur gear(4) as follows:
  - (1) Heat gear in hot oil tank.
  - (2) Chill impeller and shaft assembly.
  - (3) Ensure proper spline alignment of spur gear(4) and impeller shaft(6) by marking any mating splines with a Colorbrite No. 2101 silver pencil or equivalent. Ensure marks can be seen as parts are pressed together.
  - (4) Position gear, spline end down, on shaft and press to seat with PWA 50402 drift and standard arbor press.
- e. Copy serial number of bearing on tag and keep with assembly until installed bearing assembly is complete.
- f. Comply with step g, if using PWA 50616 base; comply with step h, if using PWA 50648 base.
- g. Install roller bearing inner race and rollers(3) using PWA 50616 base as follows:
  - (1) Secure PWA 50616 base to PWA 21500 adapter.
  - (2) Install roller bearing inner race and rollers(3) by positioning bearing serial number up on shaft(6).
  - (3) Press roller bearing inner race and rollers(3) to seat using PWA 50402 drift and standard arbor press.

- h. Install roller bearing inner race and rollers(3) using PWA 50648 base as follows:
  - (1) Install roller bearing inner race and rollers(3) by positioning bearing serial number up on shaft(6).
  - (2) Place PWA 50648 base on standard arbor press.
  - (3) Press roller bearing inner race and rollers(3) to seat using PWA 50402 drift and standard arbor press.
- i. Install roller bearing inner race retaining nut(1) as follows:
  - (1) If required, place impeller shaft assembly on PWA 50616 base.
  - (2) Install key washer(2) so tangs engage slots in gear.
  - (3) Mark key washer and adjacent surface using Colorbrite No. 2101 silver pencil or equivalent, in such manner that any rotation of key washer can be detected when torquing nut.
  - (4) Install retaining nut with markings up. Use PWA 55824 wrench and standard torque wrench. Torque retaining nut 475 to 525 pound-inches.
  - (5) Check index marks to ensure key washer has not rotated and sheared tabs.
  - (6) Wipe to remove index marks.
  - (7) Stake key washer, all but two places 180 degrees apart.

**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**GEARSHAFT ASSEMBLY, BEVEL, SPUR, GEARBOX DRIVE -**

**ASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 6

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 6 . . . . .					0

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS****Nomenclature**

Pencil (crayon),  
silver, metal  
marking (hard)

**Specification/Vendor Part Number**

Colorbrite No. 2101 or  
Color-Tex 1843 or  
Anadel No. 1936

**EXPENDABLE ITEMS****Nomenclature**

Key washer

**Part Number**

2147887

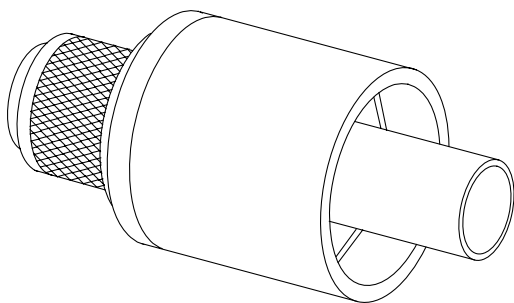
**Quantity**

1

**APPLICABLE SUPPORT EQUIPMENT**

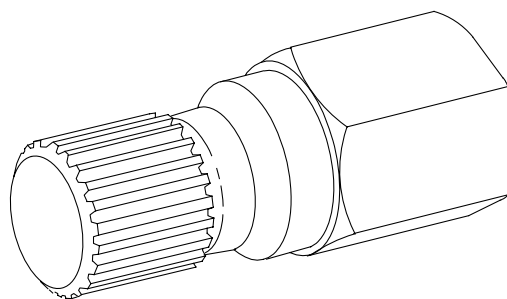
<b>Paragraph</b>	<b>Function - Tool Nomenclature</b>	<b>Tool Number</b>
2	Gearbox Drive Spur Bevel Gearshaft - Assembly	
	Drift, gearshaft bearing and gear - - - -	PWA 50432
	Holder, gearshaft - - - - -	PWA 50433
	Wrench, gearshaft roller bearing inner race retaining nut - - - - -	PWA 50434
	Base, gearshaft - - - - -	PWA 57043
		or
		SAALC X8951861

ILLUSTRATED SUPPORT EQUIPMENT



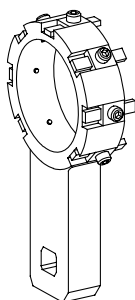
PWA 50432 -C

**Figure T1. PWA 50432 Drift**



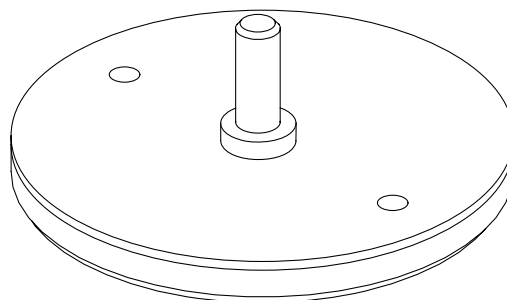
PWA 50433 -C

**Figure T2. PWA 50433 Holder**



PWA 50434 -C

**Figure T3. PWA 50434 Wrench**



PWA 57043 -C

**Figure T4. PWA 57043 Base**

**1. INTRODUCTION.**

- a. This work package contains instructions for assembly of gearbox drive spur bevel gearshaft assembly.

**2. GEARBOX DRIVE SPUR BEVEL  
GEARSHAFT - ASSEMBLY.**

(See Figures 1 and 2.)

- a. Install spur gear(4, figure 2) and roller bearing inner race and rollers(3) on end of gearshaft as follows:
  - (1) Install gearshaft(5) silver plated gear end down in PWA 57043 or SAALC X8951861 base. See figure 1 for sealing surface which shall not be scratched.

**NOTE**

Serial number will be hidden when bearing is installed.

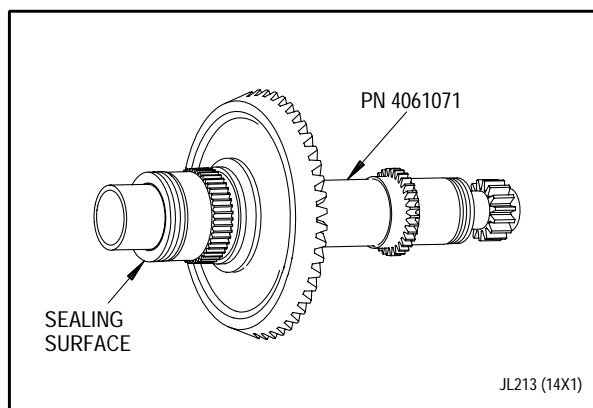
- (2) Record serial number of bearing on tag to be kept with gearshaft.
- (3) Heat spur gear and roller bearing inner race and rollers in hot oil tank.
- (4) Position gear, large OD gear web down, on gearshaft and use PWA 50432 drift and standard arbor press to seat gear on gearshaft.
- (5) Position bearing race, serial number down, on gearshaft and use PWA 50432 drift and standard arbor press to seat race on gearshaft.



b. Install roller bearing inner race retaining nut(1) as follows:

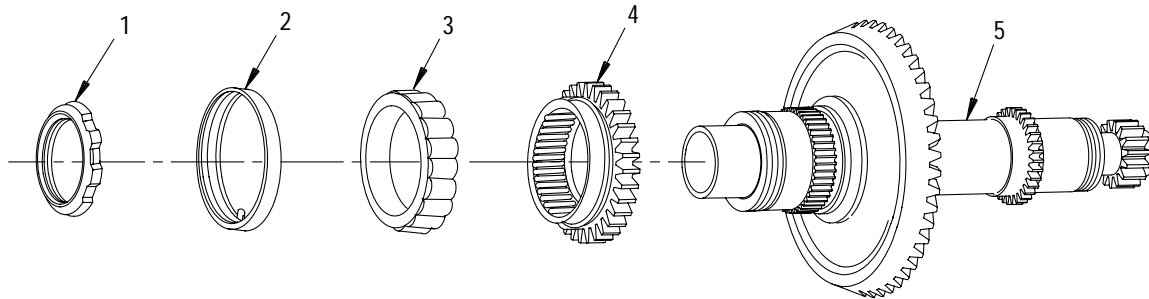
(1) Secure PWA 50433 holder, spline end up, in bench vise.

(2) Place PWA 50434 wrench, teeth up, over holder.



**Figure 1. Gearshaft Sealing Surface**

1. ROLLER BEARING RETAINING NUT
2. PN 2147887 KEY WASHER
3. ROLLER BEARING INNER RACE AND ROLLERS
4. SPUR GEAR
5. GEARBOX DRIVE SPUR BEVEL GEARSHAFT



JL001987 (24X2)

**Figure 2. Gearshaft Assembly - Assembly**

- (3) Mark key washer(2) and adjacent surface using Colorbrite No. 2101 silver pencil or equivalent, so rotation of key washer can be detected when torquing nut.
- (4) Install key washer on gearshaft so tangs of washer engage slots of gearshaft(5). Install and secure bearing retaining nut(1) handtight on gearshaft.
- (5) Install gearshaft assembly on PWA 50433 holder. Using PWA 50434 wrench and standard torque wrench, torque nut 425 to 475 pound-inches. Check index marks to ensure key washer has not rotated and sheared tabs. Remove index marks. Stake key washer, all but two places 180 degrees apart.

# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARSHAFT, SPUR, GEARBOX -

### ASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	14	4 Blank	14		

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

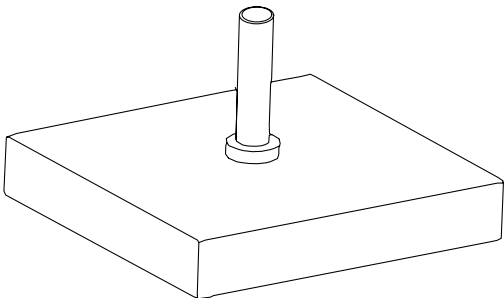
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

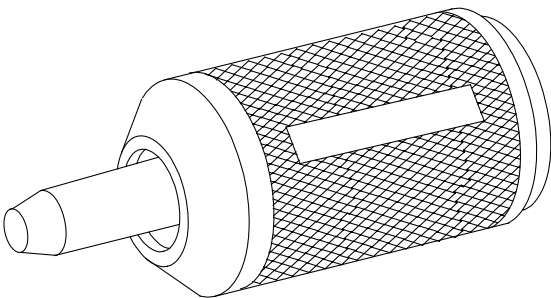
Paragraph	Function - Tool Nomenclature	Tool Number
2	GEARBOX SPUR GEARSHAFT - ASSEMBLY	
	BASE, OIL PUMP DRIVE IDLER GEARSHAFT - - - - -	PWA 50408
		OR
	BASE, MAIN GEARBOX POWER TAKE OFF DRIVESHAFT, BALL BEARINGS INNER RACE - - - - -	PWA 50648
	DRIFT, OIL PUMP DRIVE IDLER GEARSHAFTBALL AND ROLLER BEARINGS - - - - -	PWA 50448

ILLUSTRATED SUPPORT EQUIPMENT



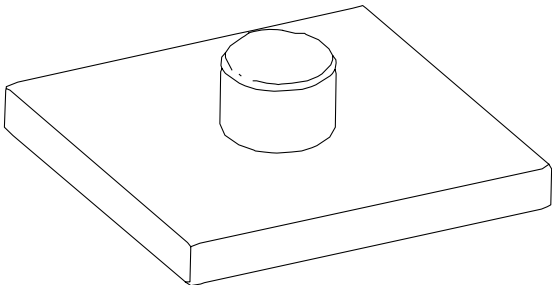
PWA 50408 -C

Figure T1. PWA 50408 BASE



PWA 50448 -C

Figure T2. PWA 50448 DRIFT



PWA 50648 -C

Figure T3. PWA 50648 BASE

**1. INTRODUCTION.**

- a. This work package contains instructions for assembly of gearbox spur gearshaft (oil pump drive idler) assembly.

**2. GEARBOX SPUR GEARSHAFT - ASSEMBLY.**

(See Figure 1.)



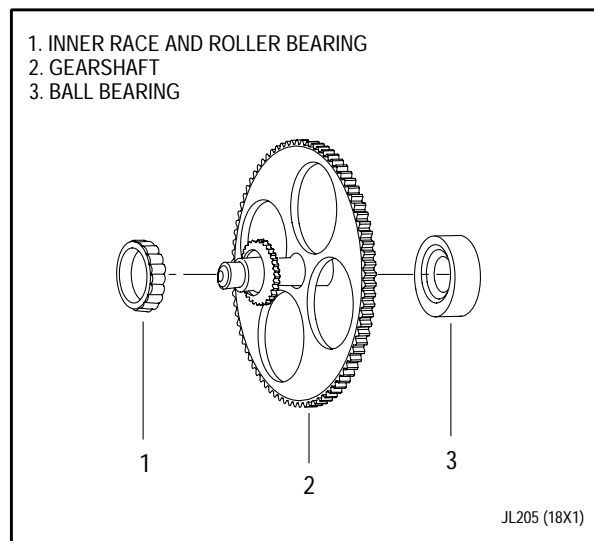
Installation of used bearings prohibited. New roller and ball bearings shall be installed or engine damage may result.

**NOTE**

Ball bearing(3) mounts on end of shaft(2), and large gear web and roller bearing inner race(1) mounts on end of shaft with small gear web.

- a. Comply with step b, if using PWA 50408 base; comply with step c, if using PWA 50648 base.

- b. Install gearshaft(2, figure 1) using PWA 50408 base as follows:
  - (1) Install gearshaft(2) over center post of PWA 50408 base.
  - (2) Position bearing(3) over end of shaft(2) serial number up. Using PWA 50448 drift and standard arbor press, press to seat.
- c. Install gearshaft(2) using PWA 50648 base as follows:
  - (1) Place PWA 50648 base on standard arbor press.
  - (2) Position bearing(3) over end of shaft(2) serial number up.
  - (3) Using PWA 50448 drift and standard arbor press, press bearing(3) to seat.
- d. Reverse gearshaft(2) on base and repeat steps a. and b. to install bearing(1) with serial number on inner race down and serial number on roller cage up.



**Figure 1. Gearbox Spur Gearshaft - Assembly**



**WORK PACKAGE****TECHNICAL PROCEDURES**

**COVER, UPPER, GEARBOX - GEARSHAFT, BEVEL, GEARBOX - SLEEVE, SEALING,  
GEARBOX -**

**ASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 14

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 . . . . .	20	7 - 8 . . . . .	0	12 . . . . .	20
2 - 5 . . . . .	0	9 . . . . .	20	13 Added . . . . .	20
6 . . . . .	20	10 - 11 . . . . .	0	14 Blank Added . . . . .	20

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

<b>Nomenclature</b>	<b>Specification/Vendor Part Number</b>
Coating, dry film lubricant, PWA 298	Drilube 850N or Everlube 811
Pencil (crayon), silver, metal marking (hard)	Colorbrite No. 2101 or Color-Tex 1843 or Anadel No. 1936
Oil, Lubricating	MIL-L-7808

**EXPENDABLE ITEMS**

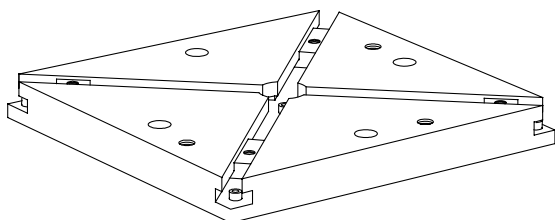
<b>Nomenclature</b>	<b>Part Number</b>	<b>Quantity</b>
Key washer	171752	3
Key washer	4002713	1
Key washer	4002710	1
Key washer	4022340	1



### APPLICABLE SUPPORT EQUIPMENT

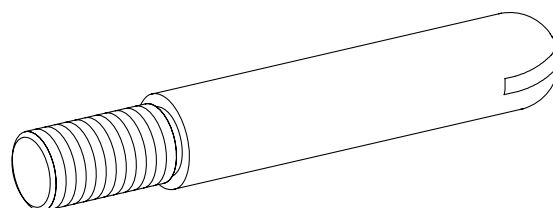
Paragraph	Function - Tool Nomenclature	Tool Number
2	Gearbox Upper Cover, Gearbox Bevel Gearshaft and Gearbox Sealing Sleeve - Assembly	
	Adapter, Various bases holding - - - - -	PWA 21500
	Pin, Alignment - - - - -	PWA 50403
	Drift, Towershaft gear housing ball bearing outer race - - - - -	PWA 50453
	Holder, Towershaft gear housing - - - - -	PWA 50454
	Wrench, Towershaft ball bearing outer race nut - - - - -	PWA 50455
	Drift, Towershaft gear, roller bearing inner race - - - - -	PWA 50456
	Drift, Towershaft gear and sleeve subassembly ball bearing inner race -	PWA 50457
	Wrench, Towershaft gear roller bearing inner race retaining nut - - - - -	PWA 50459
	Wrench, Towershaft gear ball bearing inner race nut - - - - -	PWA 50460
	Drift, Towershaft gear roller bearing outer race - - - - -	PWA 50461
	Holder, Towershaft gear and sleeve subassembly - - - - -	PWA 50465
	Base, Towershaft gear housing ball bearing outer race - - - - -	PWA 50476
	Base - - - - -	PWA 50648

### ILLUSTRATED SUPPORT EQUIPMENT



PWA 21500 -C

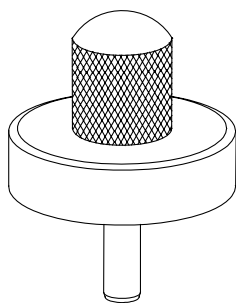
Figure T1. PWA 21500 Adapter



PWA 50403 -C

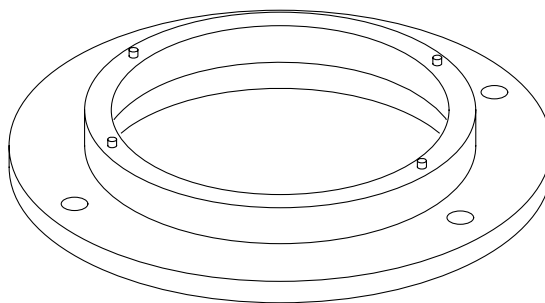
Figure T2. PWA 50403 Pin

**ILLUSTRATED SUPPORT EQUIPMENT (continued)**



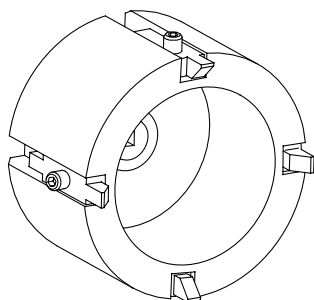
PWA 50453 -C

**Figure T3. PWA 50453 Drift**



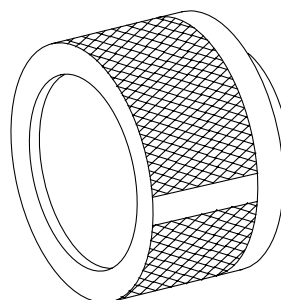
PWA 50454 -C

**Figure T4. PWA 50454 Holder**



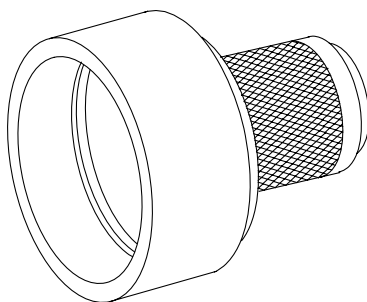
PWA 50455 -C

**Figure T5. PWA 50455 Wrench**



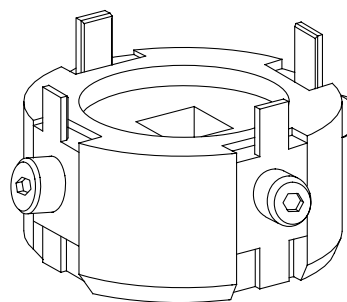
PWA 50456 -C

**Figure T6. PWA 50456 Drift**



PWA 50457 -C

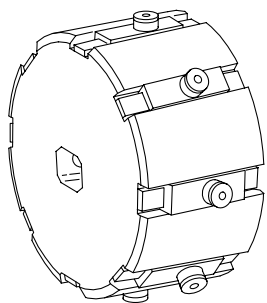
**Figure T7. PWA 50457 Drift**



PWA 50459 -C

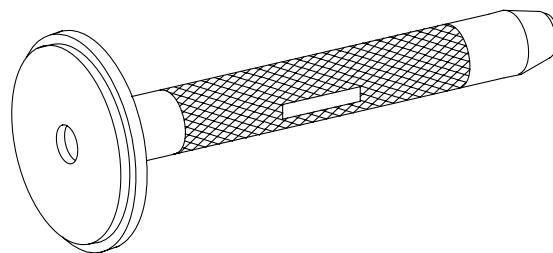
**Figure T8. PWA 50459 Wrench**

**ILLUSTRATED SUPPORT EQUIPMENT (continued)**



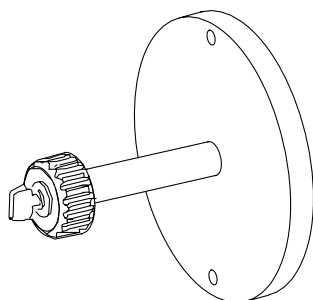
PWA 50460 -C

**Figure T9. PWA 50460 Wrench**



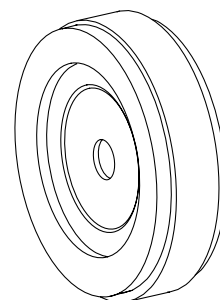
PWA 50461 -C

**Figure T10. PWA 50461 Drift**



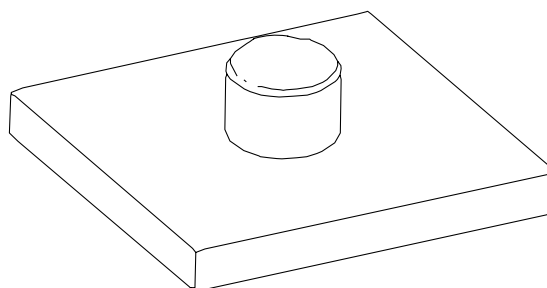
PWA 50465 -C

**Figure T11. PWA 50465 Holder**



PWA 50476 -C

**Figure T12. PWA 50476 Base**



PWA 50648 -C

**Figure T13. PWA 50648 Base**

## 1. INTRODUCTION.

- a. This work package contains instructions for assembly of the gearbox upper cover, gearbox bevel gearshaft and gearbox sealing sleeve.

## 2. GEARBOX UPPER COVER, GEARBOX BEVEL GEARSHAFT, AND GEARBOX SEALING SLEEVE - ASSEMBLY.

(See Figures 1 and 2.)

- a. Install roller bearing outer race(15, figure 1) in cover(14) as follows:
  - (1) Install two PWA 50403 guide pins into retaining bolt holes in cover.
  - (2) Position race(15) so boltholes in ears of bearing flange engage pins.
  - (3) Using PWA 50461 drift and standard arbor press, press bearing race(15) into cover(14).
  - (4) Remove tools.
  - (5) Install key washers(16) with prebent tabs in locking hole of outer race. Install bolts(17) torque bolts 65 to 85 pound-inches. Ensure prebent tab of key washer is installed in hole. Bend remaining tabs to secure.

- b. Install roller bearing inner race and rollers(11) on gearshaft(10) as follows:

- (1) Check serial number of inner race against number of outer race previously installed. If details are not matched, new bearing shall be installed.

- (2) Heat inner race and rollers(11) in hot oil bath.

- (3) Comply with step [a] if using PWA 50465 holder; comply with step [b] if using PWA 50648 base.

- (a) Install gearshaft(10) on PWA 50465 holder so splines of gearshaft engage detail splined adapter.

- (b) Place PWA 50648 base on standard arbor press; place gearshaft(10) on PWA 50648 base.

**NOTE**

Maintain bearing rollers in an inward position as cage and rollers may separate.

- (4) Place heated inner race and rollers(11) on gearshaft(10), serial number up, using PWA 50456 drift and standard arbor press, press bearing onto gearshaft.
- c. Install roller bearing inner race retaining nut(13) as follows:
  - (1) Install PWA 50465 holder and gearshaft(10) on PWA 21500 adapter and check cap screw detail of holder is securely retaining detail splined adapter.
  - (2) Apply light coat of PWA 298 dry film lubrication on side of key washer(12) that mates with nut.
  - (3) Mark key washer(12) and adjacent surface using Colorbrite No. 2101 silver pencil or equivalent, so rotation of key washer can be detected when torquing nut.
  - (4) Install lubed key washer(12) so ID tabs engage slots of gearshaft, which is still secured in PWA 50465 holder.

- (5) Allowing sufficient time for race to cool, install retaining nut(13). Using torque wrench and PWA 50459 wrench, torque nut. Check index marks to ensure key washer has not rotated and sheared tabs. Wipe to remove index marks. Crimp key washer, in all but two places 180 degrees apart.

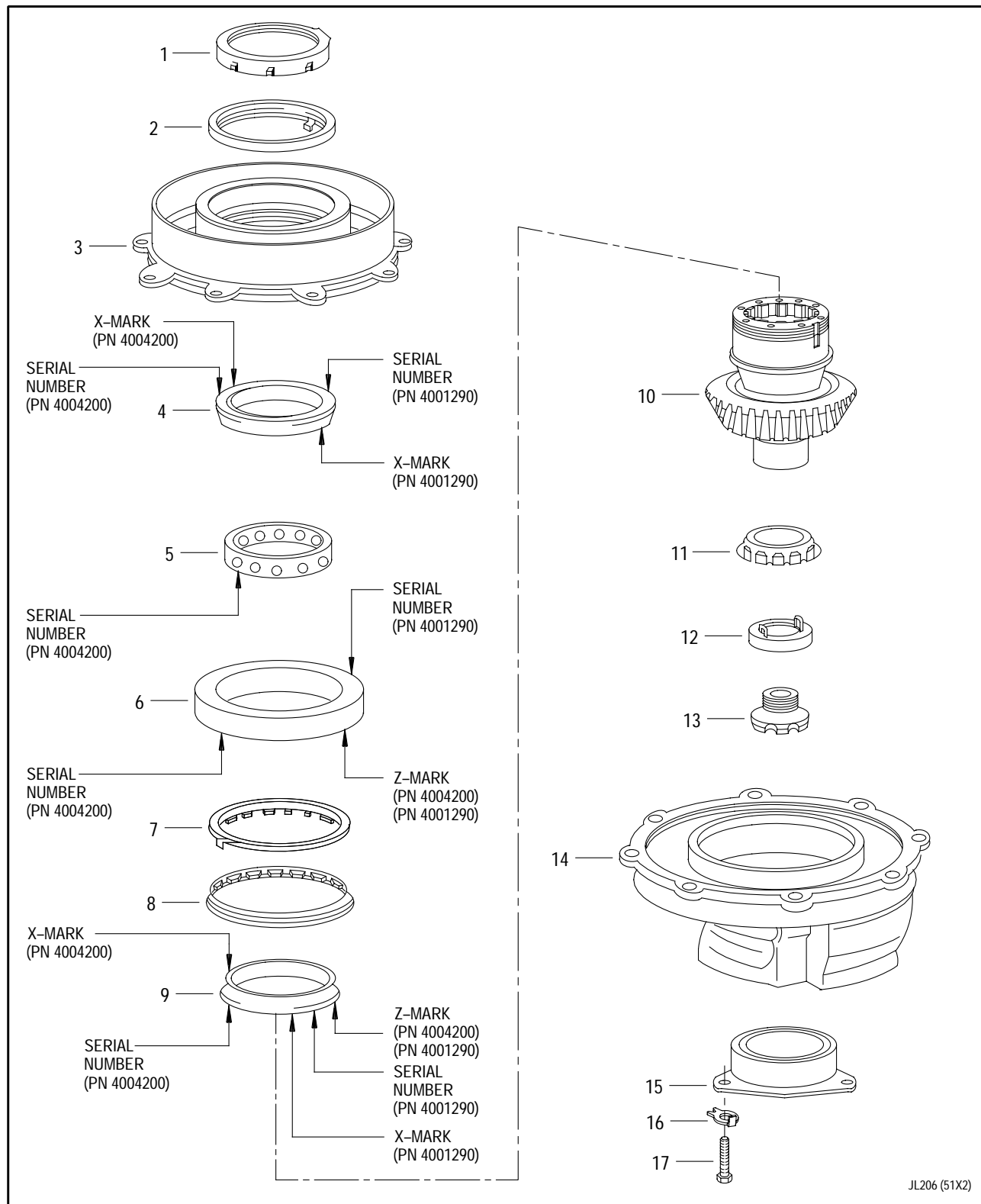
- d. Install ball bearing outer race(6) into sealing sleeve(3) as follows:

- (1) Install sealing sleeve(3), bolt scallops up, onto PWA 50476 base.

**NOTE**

If it appears that serial number will not be visible when installed, record number on tag and keep with assembly until bearing is fully assembled.

- (2) Place bearing outer race(6), Z-mark up, in sealing sleeve(3).
- (3) Install PWA 50453 drift in guide hole of base, using standard arbor press, press race into sealing sleeve.



**Figure 1. Gearbox Upper Cover, Gearbox Bevel Gearshaft, and Gearbox Sealing Sleeve - Assembly**

## Legend for figure 1

Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Bearing (inner race) retaining nut	PWA 298	550 to 650	-
2.	PN 4022340 key washer	PWA 298	-	-
3.	Gearbox sealing sleeve	-	-	-
4.	Bearing inner race upper half	-	-	-
5.	Gearbox sealing sleeve bearing	-	-	-
6.	Bearing outer race	-	-	-
7.	PN 4002710 key washer	Lubricating oil	-	-
8.	Bearing inverted nut	Lubricating oil	575 to 625	-
9.	Bearing inner race lower half	-	-	-
10.	Gearbox bevel gearshaft	-	-	-
11.	Bearing inner race and rollers	-	-	-
12.	PN 4002713 key washer	Lubricating oil	-	-
13.	Bearing (inner race) retaining nut	Lubricating oil	250 to 270	-
14.	Gearbox upper cover	-	-	-
15.	Bearing outer race	-	-	-
16.	PN 171752 key washer	-	-	-
17.	Bolt	Lubricating oil	65 to 85	-

e. Install ball bearing outer race retaining nut(8) as follows:

- (1) Secure PWA 50454 holder to PWA 21500 adapter.
- (2) Install sealing sleeve(3), bolthole scallops up, on holder so dowel pins of holder engage bolthole scallops.
- (3) Apply light coat of PWA 298 dry film lubrication to side of key washer(7) that mates with nut.
- (4) Install key washer(7), tabs up, so OD tabs engage slot in sealing sleeve(3).
- (5) Mark key washer and adjacent surface using Colorbrite No. 2101 silver pencil or equivalent, so rotation of key washer can be detected when torquing nut.
- (6) Install nut(8) and using torque wrench and PWA 50455 wrench, torque nut. Check index marks to ensure key washer has not rotated and sheared tabs. Wipe to remove index marks. Lock key washer and bend remaining tabs around nut. At least one tab shall be tight in slot of nut.

f. Install ball bearing split inner races(4 and 9), sealing sleeve bearing(5); join sealing sleeve(3) to gearshaft(10) as follows:

- (1) Heat bearing details in oil bath.

- (2) Comply with steps 3 and 4 if using PWA 50465 holder; comply with step 5 if using PWA 50648 base.

- (3) Remove cap screw and splined adapter from center post of PWA 50465 holder.

- (4) Install gearshaft(10) over center post, roller bearing end down, and position detail splined adapter to engage center post of tool and gearshaft(10) spline. Secure with cap screw.

- (5) Place PWA 50648 base on standard arbor press. Place gearshaft(10) on base.

- (6) Check serial number of lower inner race bearing detail(9) with previously installed outer race and position race in place on gear with X-mark in direction shown. Bearing inner races shall be assembled with X-marks aligned within  $\pm 5$  degrees. Z-marks shall face down. Using PWA 50457 drift and standard arbor press, press lower inner race(9) on gearshaft(10).



**NOTE**

Balls in cage and ball assembly are loose; do not drop.

- (7) Install sealing sleeve bearing(5), serial number up, on lower inner race(9). If PN 4004200 is used, install with serial number down.
  - (8) Position outer race(6) and sealing sleeve assembly(3), down, on lower inner race(9) mounted on gearshaft.
  - (9) Check serial number of upper inner race bearing(4) with serial number of outer race(6). Place inner race bearing(4) on gearshaft(10) with serial number up and X-marks on each race section aligned. Press upper inner race(4) on gearshaft(10) with PWA 50457 drift and standard arbor press.
- g. Prepare ball bearing inner race retaining nut(1) and key washer(2) for installation as follows:

**NOTE**

- Use dry nitrogen or dry oil free compressed air for spray pressure.
  - Heat lamp, dry nitrogen or dry oil free compressed air, at less than 30 psig, directed at part may be used to facilitate drying of lubricant on contact.
- (1) Using spray gun or airbrush, apply PWA 298 dry film lubricant to key washer(2) and both sides and threads of nut(1). Lubricant shall appear dry on contact.

- (2) Surface of part shall not exceed 140°F (60°C).
- (3) Air dry part for 30 minutes minimum.
- (4) Cure part at 155° to 205°F (68.3° to 96.1°C) for 2 hours minimum, raise temperature 375° to 425°F (190.6° to 218.3°C) and hold for 2 hours minimum.
- (5) Remove part from oven and allow to cool to room temperature.

h. Install ball bearing inner race retaining nut(1) as follows:

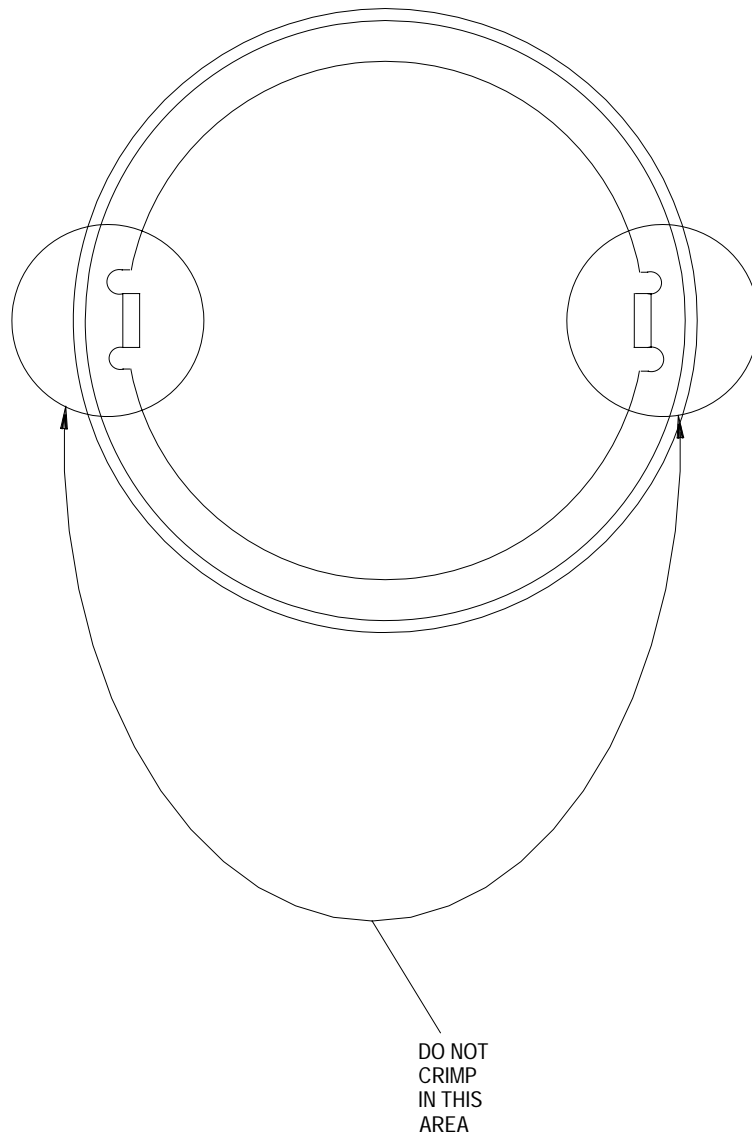
- (1) Secure PWA 50465 holder to PWA 21500 adapter.
- (2) Install key washer(2) so ID tabs engage slots in gearshaft(10).
- (3) Mark key washer and adjacent surface using metal marking crayon so rotation of key washer can be detected when torquing nut.



Crimping key washer in area adjacent to anti-rotation tabs may lead to key washer failure and engine malfunction.

- (4) Allowing sufficient time for race to cool, install retaining nut(1). Torque nut using torque wrench and PWA 50460 wrench. Check index marks to ensure key washer has not rotated and sheared tabs. Wipe to remove index marks. Using standard punch, crimp key washer in four places (see figure 2). Remove tools.

i. Store gearshaft and sealing sleeve assembly(3) with cover assembly(14) to prevent intermixing of assemblies.



104840 (48X2)

Figure 2. Key Washer PN 4022340



# WORK PACKAGE

## TECHNICAL PROCEDURES

### REDUCTION GEARBOX ASSEMBLY -

### ASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 16

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 6 . . . . .	14	8 - 11 . . . . .	0	15 . . . . .	2
7 . . . . .	11	12 - 14 . . . . .	11	16 . . . . .	14

## REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Air Flow Check Using PWA 50047 Pneumatic Test Set - General Procedures - - - - -	WP 025 00
Air Flow Check Using Habco 1093005 Portable Air Flow Checker - General Procedures - - - - -	SWP 025 01
Oil Nozzle Assembly, Air or Visual Flow Check - - - - -	WP 026 00
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Reduction Gearbox Assembly Oil Flow Test - - - - -	WP 702 00

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
OIL, LUBRICATING	MIL-L-7808
PENCIL (CRAYON), SILVER, METAL	COLORBRITE NO.2101 OR COLOR-TEX
MARKING (HARD)	1843 OR ANADEL NO.1936

## EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
KEY WASHER	171752	3
KEY WASHER	4014749	5
KEY WASHER	4061084	1
KEY WASHER	4061086	1
PACKING, PREFORMED	M83248-1-048	1
PACKING, PREFORMED	ST1000-013	1
PACKING, PREFORMED	ST1000-152	1

## APPLICABLE SUPPORT EQUIPMENT

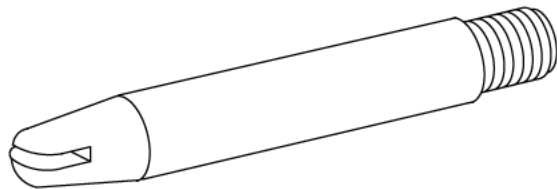
Paragraph	Function - Tool Nomenclature	Tool Number
2	MAIN FUEL PUMP INTERNAL DRIVE GEAR - ASSEMBLY AND INSTALLATIONI	
	DRIFT, REDUCTION GEARBOX ROLLER BEARING (INNER RACE) - - - - -	PWA 57068
	DRIFT, REDUCTION GEARBOX BALL BEARING - - - - -	PWA 57067
	ADAPTER, VARIOUS BASES HOLDING - - - - -	PWA 21500
	WRENCH, REDUCTION GEARBOX BALL BEARING OUTER RACE NUT - - - - -	PWA 57056
	PLIERS, BENDING, REDUCTION GEARBOX KEY WASHER - - -	PWA 57054
	WRENCH, REDUCTION GEARBOX BALL BEARING INNER RACE NUT - - - - -	PWA 57057
	CRIMPER, REDUCTION GEARBOX KEY WASHER - - - - -	PWA 57066
3	REDUCTION GEARBOX OIL SEAL RETAINER - ASSEMBLY	
	BASE, INSTALLATION, REDUCTION GEARBOX SEAL - - - - -	PWA 57053
	DRIFT, INSTALLATION, REDUCTION GEARBOX SEAL - - - - -	PWA 57052
4	REDUCTION GEARBOX OIL SEAL RETAINER ASSEMBLY - INSTALLATION	
	PIN, GUIDE, REDUCTION GEARBOX SEAL ASSEMBLY - - - - -	PWA 14383
	PULLER, CARBON SEAL RETAINER, REDUCTION GEARBOX - -	PWA 57061
5	REDUCTION GEARBOX - AIRFLOW CHECK	
	BASE - - - - -	PWA 57088
	PLUG, BEVEL GEARSHAFT BORE - - - - -	PWA 57101
	COVER - - - - -	PWA 57152
	ADAPTER - - - - -	PWA 57182
		OR
	ADAPTER - - - - -	SAALC 9053739
	REGULATOR ASSEMBLY, AIR SOURCE - - - - -	PWA 21875
	TEST SET, PNEUMATIC PRESSURE CART - - - - -	PWA 50047
		OR
	PORTABLE AIR FLOW CHECKER - - - - -	HABCO 1093005

ILLUSTRATED SUPPORT EQUIPMENT



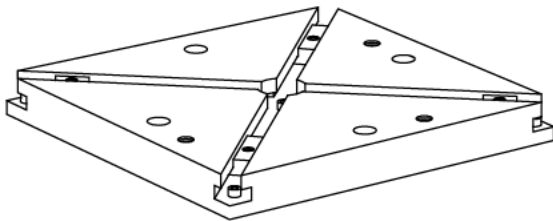
HABCO 1093005 -C

**Figure T1. HABCO 1093005 PORTABLE AIR FLOW CHECKER**



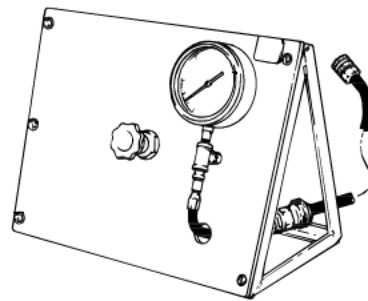
PWA 14383 -C

**Figure T2. PWA 14383 PIN**



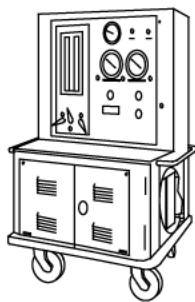
PWA 21500 -C

**Figure T3. PWA 21500 ADAPTER**



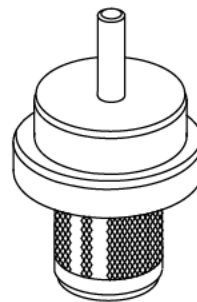
PWA 21875 -C

**Figure T4. PWA 21875 REGULATOR ASSEMBLY**



PWA 50047 -C

**Figure T5. PWA 50047 TEST SET**

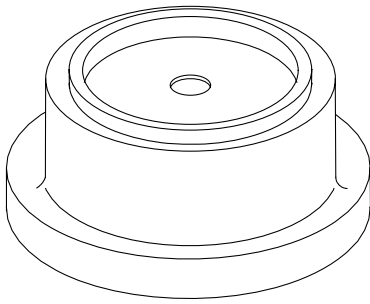


PWA 57052 -C

**Figure T6. PWA 57052 DRIFT**

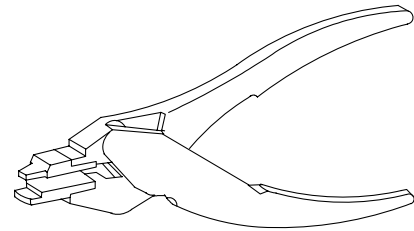


ILLUSTRATED SUPPORT EQUIPMENT (continued)



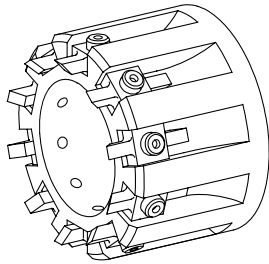
PWA 57053 -C

**Figure T7. PWA 57053 BASE**



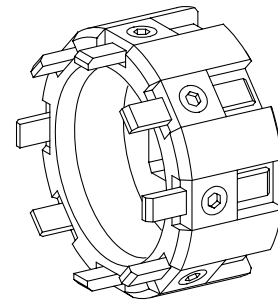
PWA 57054 -C

**Figure T8. PWA 57054 PLIERS**



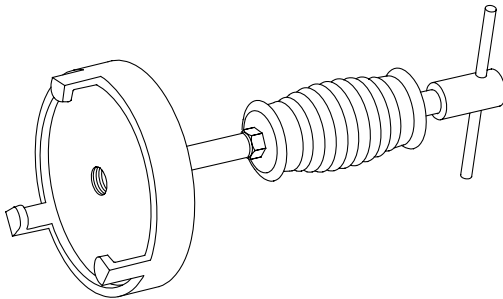
PWA 57056 -C

**Figure T9. PWA 57056 WRENCH**



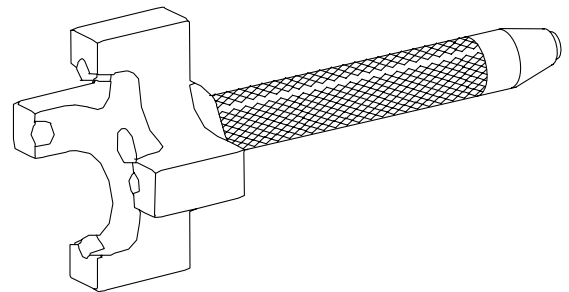
PWA 57057 -C

**Figure T10. PWA 57057 WRENCH**



PWA 57061 -C

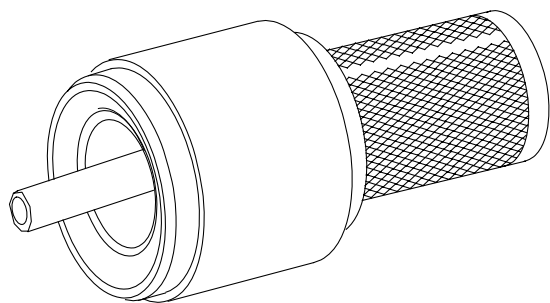
**Figure T11. PWA 57061 PULLER**



PWA 57066 -C

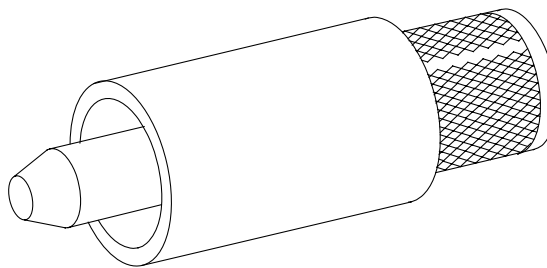
**Figure T12. PWA 57066 CRIMPER**

ILLUSTRATED SUPPORT EQUIPMENT (continued)



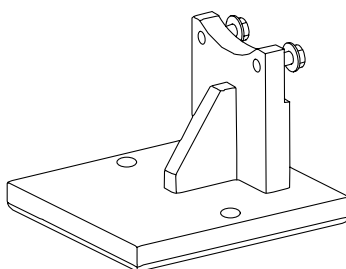
PWA 57067 -C

**Figure T13. PWA 57067 DRIFT**



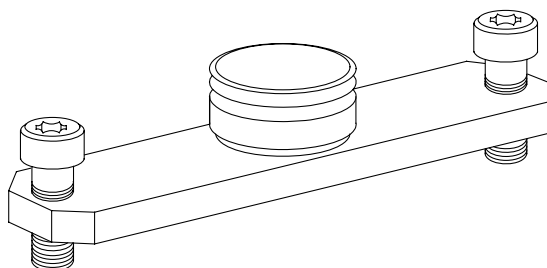
PWA 57068 -C

**Figure T14. PWA 57068 DRIFT**



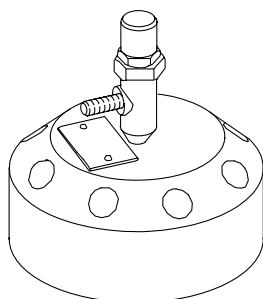
PWA 57088 -C

**Figure T15. PWA 57088 BASE**



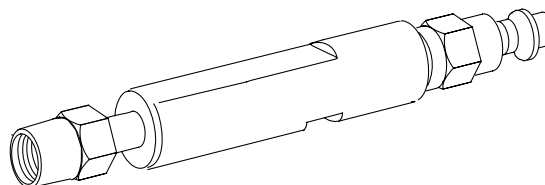
PWA 57101 -C

**Figure T16. PWA 57101 PLUG**



PWA 57152 -C

**Figure T17. PWA 57152 COVER**



PWA 57182 -C

**Figure T18. PWA 57182 ADAPTER**

## 1. INTRODUCTION.

- a. This work package contains instructions for assembly of reduction gearbox assembly.

## 2. MAIN FUEL PUMP INTERNAL DRIVE GEAR - ASSEMBLY AND INSTALLATION.

(See Figure 1.)

- a. Flow check reduction gearbox oil nozzle(7, figure 1). Refer to T.O. 2J-F100-53-1, WP 026 00.
- b. Assemble main fuel pump internal drive gear(14) as follows:
  - (1) Verify serial numbers of roller bearing inner race and rollers(15) and roller bearing outer race(17) are identical.
  - (2) Place roller bearing inner race and rollers(15) in hot oil bath and heat 225° to 275°F (107° to 135°C).
  - (3) Position main fuel pump internal drive gear(14), gear end down, on arbor press.

## NOTE

It may be helpful to retain rollers with small elastic band. Ensure band is removed after use.

- (4) Position lubricated roller bearing inner race and rollers(15), serial number up, on shaft of drive gear(14).
- (5) Press roller bearing inner race and rollers(15) to seat using PWA 57068 drift and standard arbor press.
- (6) Install gearbox bearing inner spacer(16) on shaft of drive gear(14). Drift to seat using PWA 57068 drift and standard arbor press.

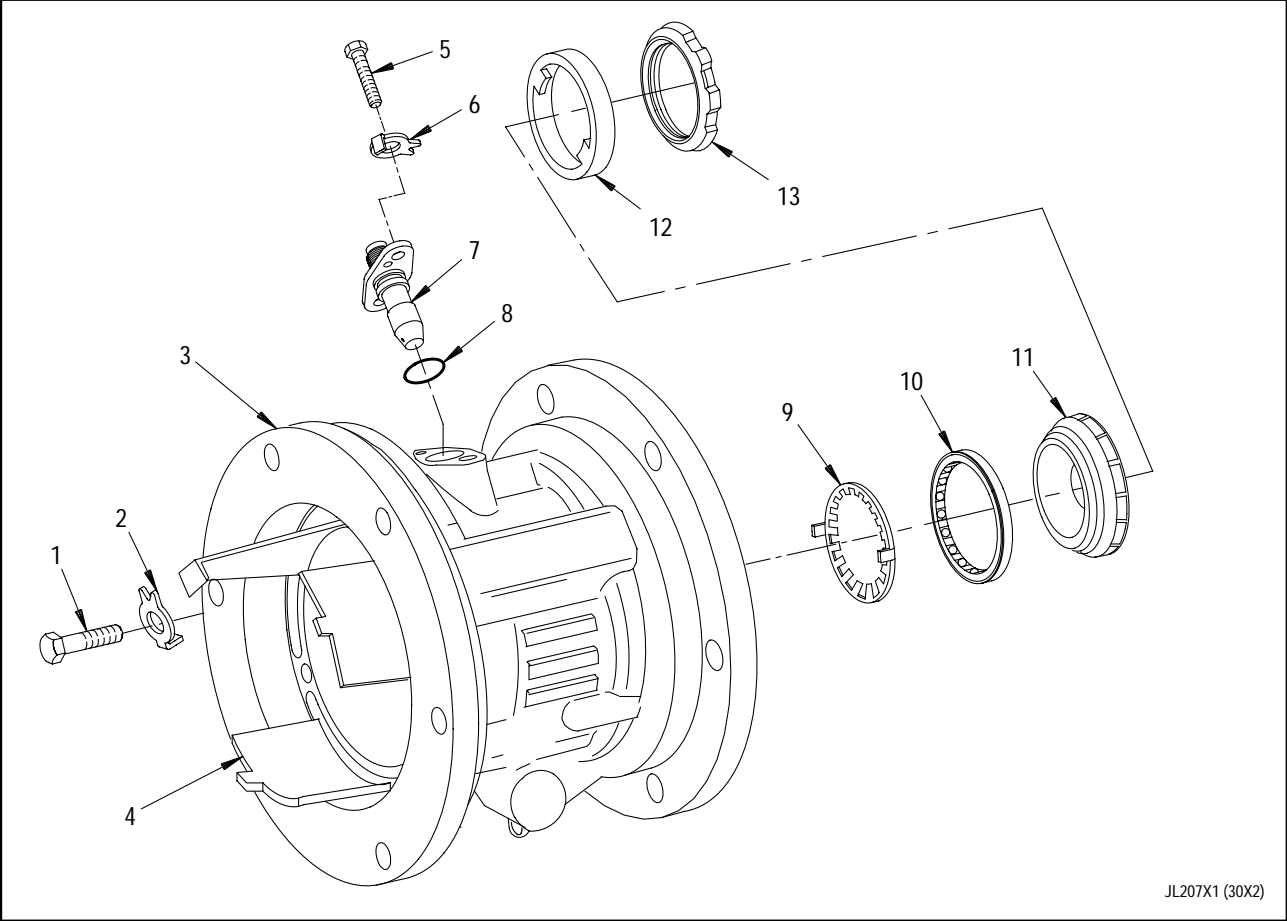
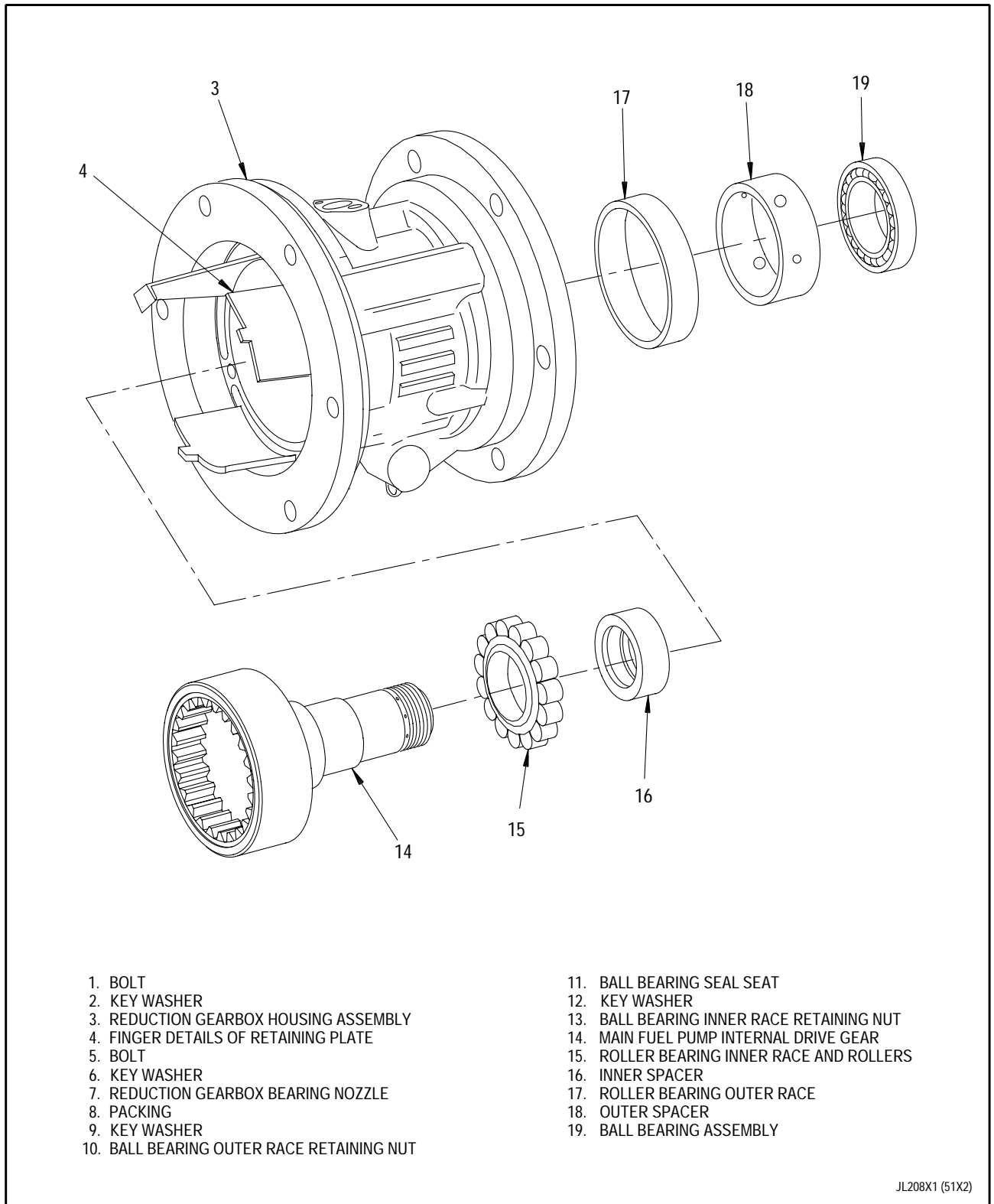


Figure 1. Reduction Gearbox Housing Assembly - Assembly (Sheet 1 of 2)



**Figure 1. Reduction Gearbox Housing Assembly - Assembly (Sheet 2 of 2)**

c. Assemble reduction gearbox housing assembly(3) as follows:

- (1) Position housing assembly(3) on bench, with finger details(4) of retaining plate facing up.

**NOTE**

The following step is required only for new housings. Housings will normally have bolts(1) and key washers(2) installed.

- (2) Secure retaining plate to reduction gearbox housing assembly(3) with PN 171752 key washers(2) and bolts(1). Torque bolts(1) 85 to 95 pound-inches. Bend tabs of key washers(2).
- (3) Place ball bearing assembly(19) and bearing seal seat(11) in hot oil bath and heat 280° to 300°F (138° to 149°C).

- (4) Place housing assembly(3) in hot oven and heat to 300°F (149°C).

**NOTE**

Steps c.(5), through c.(9) shall be performed rapidly to minimize heat loss.

- (5) Remove housing assembly(3) from oven and place on PWA 57072 fixture.
- (6) Position lubricated roller bearing outer race(17), serial number up, in inner diameter of housing assembly(3).
- (7) Press roller bearing outer race(17) to seat, using PWA 57142 drift and standard arbor press.

- (8) Install gearbox bearing outer spacer(18), aligning largest hole of spacer with nozzle hole in double-threaded boss of housing(3).
  - (9) Press outer spacer(18) to seat using PWA 57142 drift and standard arbor press.
  - (10) Temporarily install reduction gearbox bearing nozzle(7) into housing assembly(3) to ensure hole in outer spacer(18) is properly aligned. If outer spacer(18) is not properly aligned, correct alignment using a fiber drift. Remove nozzle(7) when alignment is completed.
  - (11) Remove housing assembly(3) from PWA 57072 fixture.
- d. Install reduction gearbox housing assembly(3) onto main fuel pump internal drive gear(14) as follows:
- (1) Remove detail-7 spacer from PWA 57072 fixture.
  - (2) Position drive gear(14), large gear end down, on PWA 57072 holding fixture.
  - (3) Install heated housing(3), with finger details(4) of retaining plate facing down, over shaft of drive gear(14), engaging roller bearing outer race(17) with roller bearing inner race and rollers(15).
  - (4) Ensure housing assembly(3) is properly seated on PWA 57072 holding fixture.
  - (5) Install heated ball bearing assembly(19), puller groove up, on shaft of drive gear(14) and in inner diameter of housing assembly(3). Press to seat using PWA 57067 drift and standard arbor press.
  - (6) Remove built up reduction gearbox housing(3) from PWA 57072 holding fixture and install detail-7 spacer over detail-4 shaft of fixture.
  - (7) Install reduction gearbox housing(3) on PWA 57072 holding fixture with finger details(4) of retaining plate facing down.
  - (8) Ensure housing assembly(3) is properly seated on PWA 57072 holding fixture.
  - (9) Press housing assembly(3) to seat using PWA 57067 drift and standard arbor press.
  - (10) Install drive gear(14), housing assembly(3) and PWA 57072 holding fixture into PWA 21500 holding adapter.
  - (11) Coat PN 4061084 key washer(9) with lubricating oil.

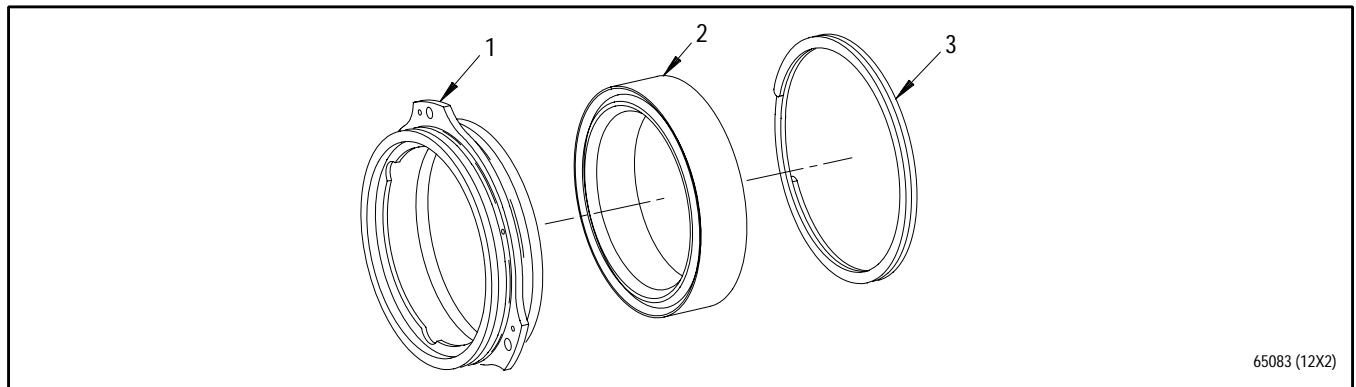
- (12) Install key washer(9), bent tabs side down, on shaft, aligning tabs with slots in bearing retaining plate. Mark key washer and adjacent surface using Colorbrite No. 2101 silver pencil or equivalent, so rotation of key washer(9) during installation of ball bearing outer race retaining nut(10) can be detected.
- (13) Coat retaining nut(10) with lubricating oil.
- (14) Install retaining nut(10) and torque 525 to 575 pound-inches using PWA 57056 wrench, while aligning one tab of key washer(9) with inner slot of retaining nut(10).
- (15) Check index marks to ensure key washer(9) has not rotated and sheared tabs. Wipe to remove index marks.
- (16) Crimp key washer(9) to secure, using PWA 57054 pliers.
- (17) Coat PN ST1000-013 packing(8) with lubricating oil.
- (18) After housing(3) has cooled to room temperature install packing(8), onto nozzle(7) and secure with bolts(5), and PN 4014749 key washers(6) to reduction gearbox housing(3). Torque bolts 36 to 40 pound-inches, and crimp key washers(6).
- (19) Place PWA 57072 holding fixture with housing(3) on standard arbor press.
- (20) Install heated ball bearing seal seat(11), smaller outer diameter down, on shaft of drive gear(14). Press to seat using PWA 57067 drift and standard arbor press.
- (21) Secure PWA 57072 holding fixture with housing(3) to PWA 21500 holding adapter.
- (22) Coat PN 4061086 key washer(12) with lubricating oil.
- (23) Install key washer(12) on outer diameter of drive gear(14), with two internal tabs seated in slots of shaft. Mark key washer(12) and adjacent surface using metal marking crayon so rotation of key washer(12) during installation of nut(13) can be detected.
- (24) After seal seat(11) has cooled to room temperature, install seal seat retaining nut(13), using PWA 57057 wrench and standard torque wrench. Torque nut(13) 425 to 475 pound-inches.
- (25) Check index marks to ensure key washer(12) has not rotated and sheared tabs. Wipe to remove index marks.
- (26) Position PWA 57072 holding fixture with housing(3) on standard arbor press.
- (27) Crimp key washer(12) into nut(13) slots at four equally spaced places, using PWA 57066 crimper and standard arbor press.



### 3. REDUCTION GEARBOX OIL SEAL RETAINER - ASSEMBLY.

(See Figure 2.)

- a. Check face seal(2, figure 2) for freedom of movement by pushing on sealing surface by hand. Face seal should return to original position without binding or drag. Visually inspect carbon sealing surface when compressed and extended. Ensure sealing surface is parallel to carbon seal housing. If not, replace face seal.
- b. Position PWA 57053 base on standard arbor press.
- c. Heat oil seal retainer(1) to 225° to 275°F (107° to 135°C).
- d. Install lubricated oil seal retainer(1) on PWA 57053 base, smaller inner diameter facing down.
- e. Install lubricated face seal(2) on retainer(1) with carbon seal facing down.
- f. Press face seal(2) to seat using PWA 57052 drift and standard arbor press.
- g. Install retaining ring(3) in inner diameter groove of oil seal retainer(1). Ensure both rings of retaining ring(3) are seated in groove of oil seal retainer(1) for full 360 degrees.
- h. Remove assembled face seal(2) and retainer(1) from PWA 57053 base, and place on bench with carbon seal facing up. Ensure face seal(2) is completely seated in oil seal retainer(1) using a 0.001 inch offset feeler gage (stock) at three locations.



65083 (12X2)

Index No.	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Gearbox oil seal retainer	Lubricating oil	-	-
2.	Face seal	Lubricating oil	-	-
3.	Retaining ring	-	-	-

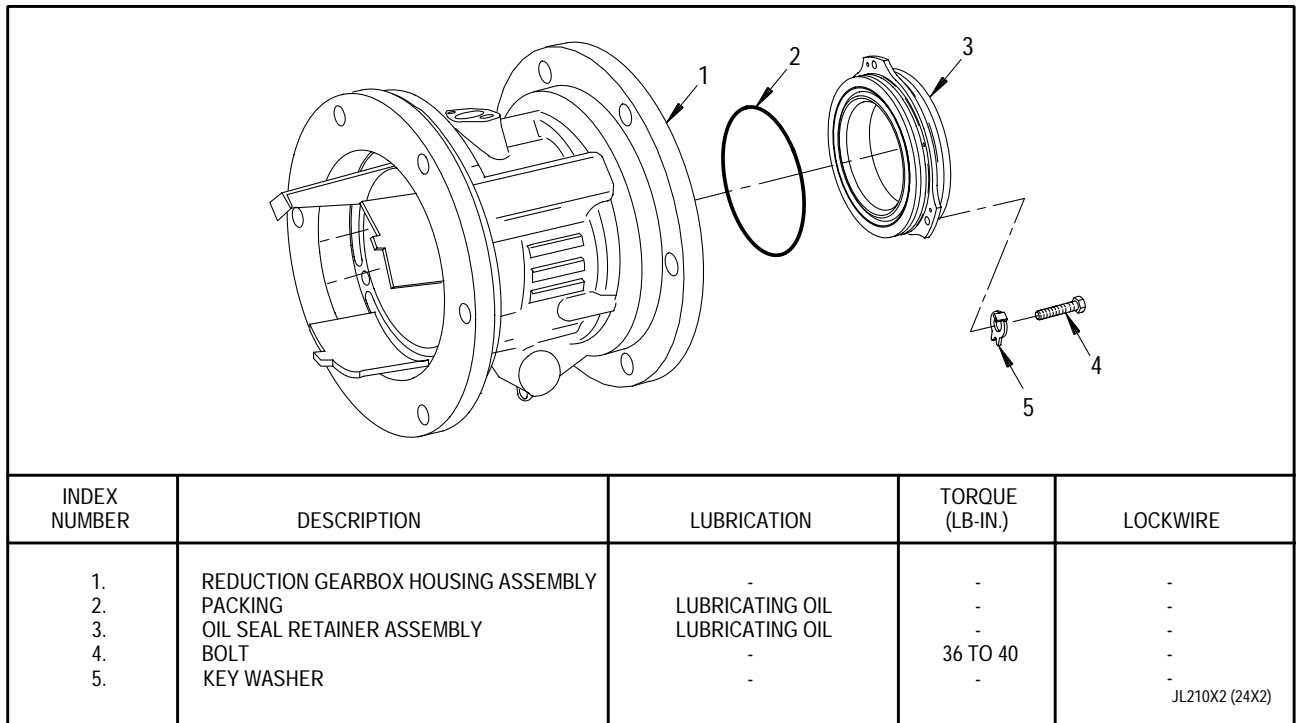
Figure 2. Reduction Gearbox Oil Seal Retainer - Assembly

**4. REDUCTION GEARBOX OIL SEAL  
RETAINER ASSEMBLY - INSTALLATION.**

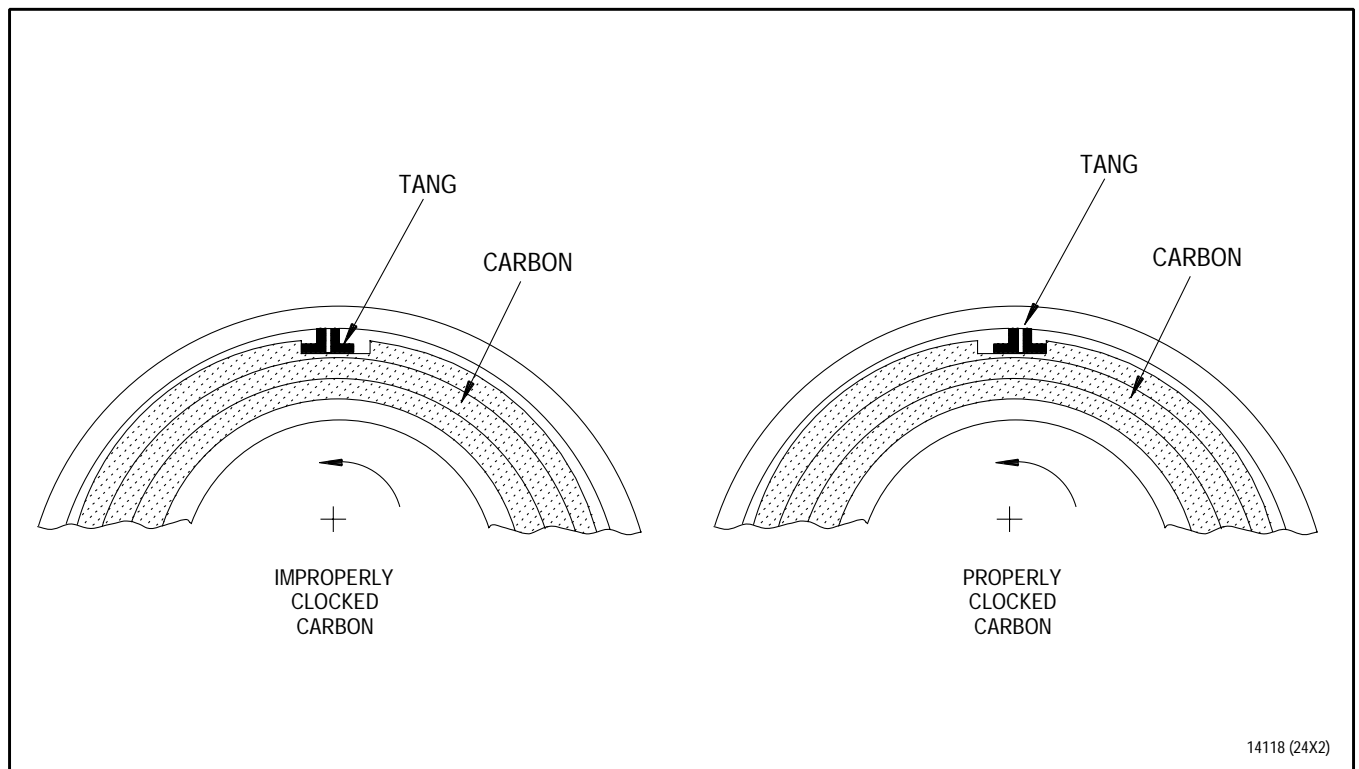
(See Figures 3 and 4.)

- a. Coat PN ST1000-152 packing(2, figure 3) with lubricating oil.
- b. Install packing(2) in outer diameter groove of oil seal retainer assembly(3).
- c. Install PWA 14383 pins into three threaded holes on inner flange of reduction gearbox housing assembly(1), for alignment of oil seal retainer assembly(3).
- d. Inspect PN 4065385 face seal to ensure that tang rests against right corner of carbon slot (see figure 4). If not, depress carbon and rotate counterclockwise.
- e. Apply light film of MIL-L-7808 lubricating oil to seal seat, and install retainer assembly(3, figure 3) with carbon seal facing down, in inner diameter of housing assembly(1) as follows:

- (1) Install retainer assembly(3) on PWA 57061 puller.
- (2) Align holes in retainer assembly(3) with slots on PWA 57061 puller and install over PWA 14383 pins.
- (3) Tap to seat retainer assembly.
- (4) Remove PWA 14383 pins.
- (5) Rotate puller and remove from retainer assembly(3).
- f. Coat bolts(4) with lubricating oil.
- g. Secure retainer assembly(3) with PN 4014749 key washers(5) and bolts(4). Torque bolts(4) 36 to 40 pound-inches. Bend key washer(5) tabs to secure.



**Figure 3. Reduction Gearbox Oil Seal Retainer - Installation**



**Figure 4. Reduction Gearbox Carbon Seal Clocking**

**5. REDUCTION GEARBOX - AIRFLOW CHECK.**

- a. Install plain flange end of reduction gearbox on PWA 57088 base.
- b. Install PWA 57101 plug into small end of gear and secure to plain flange of gearbox.
- c. Install PWA 57152 cover and PN M83248-1-048 packing on other end of reduction gearbox.

**NOTE**

Leak check procedure using engine oil, steps d and e are optional and not required if airflow check step f is performed.

- d. Connect PWA 57182 adapter or SAALC 9053739 adapter (with fitting removed from quick disconnect) to oil nozzle on reduction gearbox and to PWA 21875 regulator.
- e. Perform leak check with PWA 21875 regulator set at 10 psig. Check for leaks by applying engine oil around carbon seal, seal seat and shaft. If leakage is found perform airflow check per step f.

f. Perform airflow check as follows:

- (1) Connect SAALC 9053739 adapter (with fitting installed in quick disconnect) to oil nozzle on reduction gearbox.
- (2) If PWA 50047 pneumatic test set is to be used, perform self-test per T.O. 2J-F100-53-1, WP 025 00.
- (3) Connect air hoses from PWA 50047 test set per T.O. 2J-F100-53-1, WP 025 00, or Habco 1093005 portable air flow checker per T.O. 2J-F100-53-1, WP 025 01, to SAALC 9053739 adapter.
- (4) Perform airflow check with pressure set at 10 psig. Maximum allowable airflow leakage is 0.5 pph. If maximum limit is exceeded, replace carbon seal or seal plate as required.

g. Remove tooling.

h. Install protective covers on all openings.

# WORK PACKAGE

## TECHNICAL PROCEDURES

SEAL ASSEMBLY, FACE (DEAERATOR IMPELLER SHAFT) -

ASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3 . . . . .	0				
4 Blank . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Gearbox Module - - - - -	T.O. 2J-F100-53-1
Optical Flatness Check of Main Bearing Carbon Seals, Seal Plates, and Spacers - - - - -	SWP 091 06

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

- a. This work package contains instructions for assembly of face seal assembly.

**2. FACE SEAL ASSEMBLY (DEAERATOR IMPELLER SHAFT) - ASSEMBLY.**

- a. Check flatness of seals, plates, and spacers. Refer to T.O. 2J-F100-53-1, SWP 091 06.

- b. Assemble face seal assembly as follows:

- (1) Install wave washer spring into seal case.

- (2) Install flat washer into seal case.
- (3) Clean preformed packing and install packing into seal case.
- (4) Install carbon seal into seal case.
- (5) Press retainer into seal case and assure retainer tangs lock into slots on seal case.





# WORK PACKAGE

## TECHNICAL PROCEDURES

**SEAL ASSEMBLY, FACE (GEARBOX DRIVE SPUR BEVEL GEARSHAFT) -**

**ASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3 . . . . .	0				
4 Blank . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Optical Flatness Check of Main Bearing Carbon Seals, Seal Plates, and Spacers - - - - -	SWP 091 06

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

**1. INTRODUCTION.**

- a. This work package contains instructions for assembly of face seal assembly.

**2. FACE SEAL ASSEMBLY (GEARBOX DRIVE SPUR BEVEL GEARSHAFT) - ASSEMBLY.**

- a. Check flatness of seals, plates, and spacers. Refer to T.O. 2J-F100-53-1, SWP 091 06.

- b. Assemble face seal assembly as follows:

- (1) Install wave washer spring into seal case.

- (2) Install flat washer into seal case.
- (3) Clean preformed packing and install packing into seal case.
- (4) Install carbon seal into seal case.
- (5) Press retainer into seal case and assure retainer tangs lock into slots on seal case.



## INTRODUCTION

## GEARBOX MODULE - FINAL ASSEMBLY

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2 . . . . .		20			

**1. INTRODUCTION.**

- a. This work package introduces the 700 00 through 799 00 series of work packages and subordinate work packages for gearbox module - final assembly. The following work packages are included in this series.

<b>WP/SWP No.</b>	<b>Title</b>
701 00	Gearbox (Front) Housing - Assembly
702 00	Gearbox (Rear) Housing - Partial Assembly
703 00	Gearbox (Rear) Housing (Incorporating PTO Duplex Bearing with Split Inner Race) - Final Assembly
703 01	Gearbox (Rear) Housing (Incorporating PTO Duplex Bearing with One Piece Inner Race) - Final Assembly
704 00	Gearbox Housing (Front) - Installation on Gearbox Housing (Rear)
705 00	Gearbox - Pressure Check
706 00	Gearbox Storage or Shipment Preparation
707 00	Gearbox Module External Components - Installation
708 00 through 799 00	Open

**WORK PACKAGE**

**TECHNICAL PROCEDURES**

**GEARBOX (FRONT) HOUSING -**

**ASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 12

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 . . . . .	5	4 . . . . .	0	8 . . . . .	5
2 . . . . .	0	5 . . . . .	5	9 - 11 . . . . .	0
3 . . . . .	5	6 - 7 . . . . .	0	12 Blank . . . . .	0

## REFERENCE MATERIAL REQUIRED

Title	Number
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Gearbox Module - Table of Limits and Clearance	
Charts - - - - -	WP 801 00

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

Paragraph	Specification/Vendor Part Number
Lockwire	MS9226-04
Oil, lubricating	MIL-L-7808

## EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Rivet	402004	1
Key washer	171752	3

## APPLICABLE SUPPORT EQUIPMENT

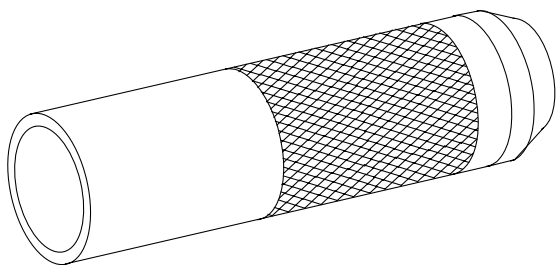
Paragraph	Function - Tool Nomenclature	Tool Number
2	Gearbox Deaerator Impeller Shaft Bearing Outer Race and Gearbox Drive Spur Bevel Gearshaft Bearing Outer Race - Installation	
	Pin, Alignment (3) - - - - -	PWA 50403
	Puller, Deaerator impeller roller bearing outer race into housing - - - - -	PWA 50637
	Puller, PTO gearshaft roller bearing outer race into housing - - - - -	PWA 50639
3	Gearbox Spur Gear and Gearbox Idler Gearshaft Assembly - Assembly and installation into gearbox (front) housing	
	Drift, Ignition alternator drive shaft roller bearing and gear - - - - -	PWA 50402
	Drift, Idler stub shaft roller bearing inner race - - - - -	PWA 50422
	Riveter, Idler stub shaft bearing retaining nut rivet - - - - -	PWA 50425



## APPLICABLE SUPPORT EQUIPMENT

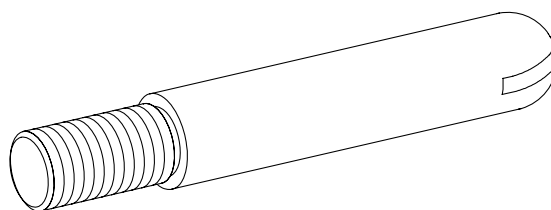
Paragraph	Function - Tool Nomenclature	Tool Number
3 (cont'd)	Drift, Idler stub shaft -----	PWA 50428
	Base, Idler stub shaftgear roller	
	bearing -----	PWA 50429
	Wrench, Idler stub shaft bearing retaining	
	nut -----	PWA 50430
	Pin, Aligning - Power take off shaft ball	
	bearing liner package -----	PWA 50876
	Base, Main gearbox (front) housing	PWA 56502
	assembly -----	or
		PWA 52760

## ILLUSTRATED SUPPORT EQUIPMENT



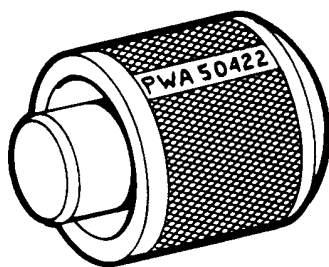
PWA 50402 -C

Figure T1. PWA 50402 Drift



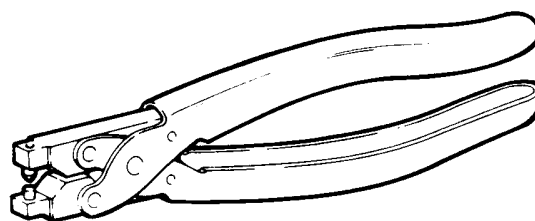
PWA 50403 -C

Figure T2. PWA 50403 Pin



PWA 50422 -C

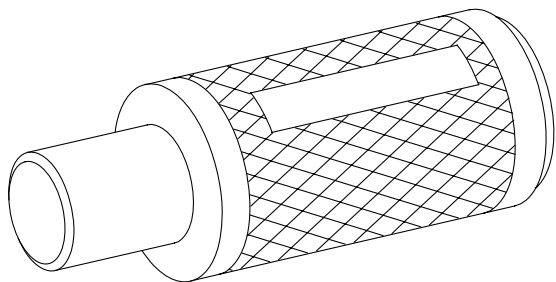
Figure T3. PWA 50422 Drift



PWA 50425 -C

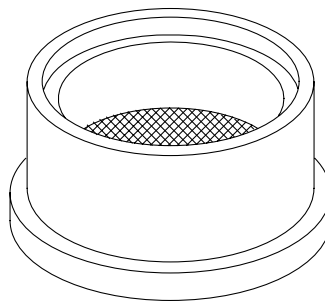
Figure T4. PWA 50425 Riveter

**ILLUSTRATED SUPPORT EQUIPMENT (continued)**



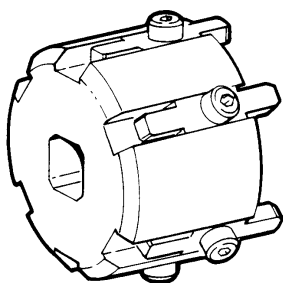
PWA 50428 -C

**Figure T5. PWA 50428 Drift**



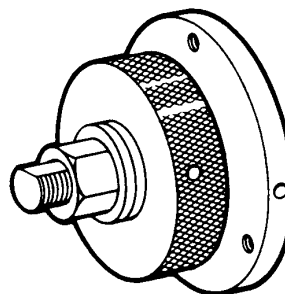
PWA 50429 -C

**Figure T6. PWA 50429 Base**



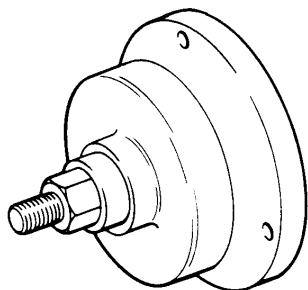
PWA 50430 -C

**Figure T7. PWA 50430 Wrench**



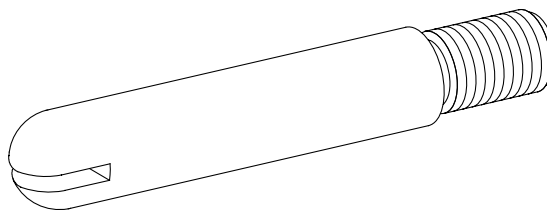
PWA 50637 -C

**Figure T8. PWA 50637 Puller**



PWA 50639 -C

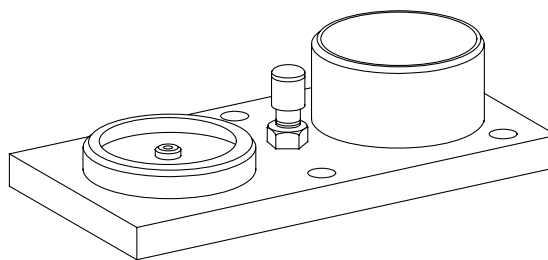
**Figure T9. PWA 50639 Puller**



PWA 50876 -C

**Figure T10. PWA 50876 Pin**

**ILLUSTRATED SUPPORT EQUIPMENT (continued)**



PWA 56502 -C

**Figure T11. PWA 56502 Base**

## 1. INTRODUCTION.

- a. This work package contains instructions for installation of gearbox spur gear and gearbox idler gearshaft assembly, gearbox deaerator impeller shaft, and gearbox drive spur bevel gearshaft bearing outer races in gearbox (front) housing.

## 2. GEARBOX DEAERATOR IMPELLER SHAFT BEARING OUTER RACE AND GEARBOX DRIVE SPUR BEVEL GEARSHAFT BEARING OUTER RACE - INSTALLATION.

(See Figure 1.)

### NOTE

Installation of these parts requires a heated front housing as well as chilled bearing races due to tight fits involved. If any delay in installation occurs, it may become necessary to reheat front housing and reheat races.

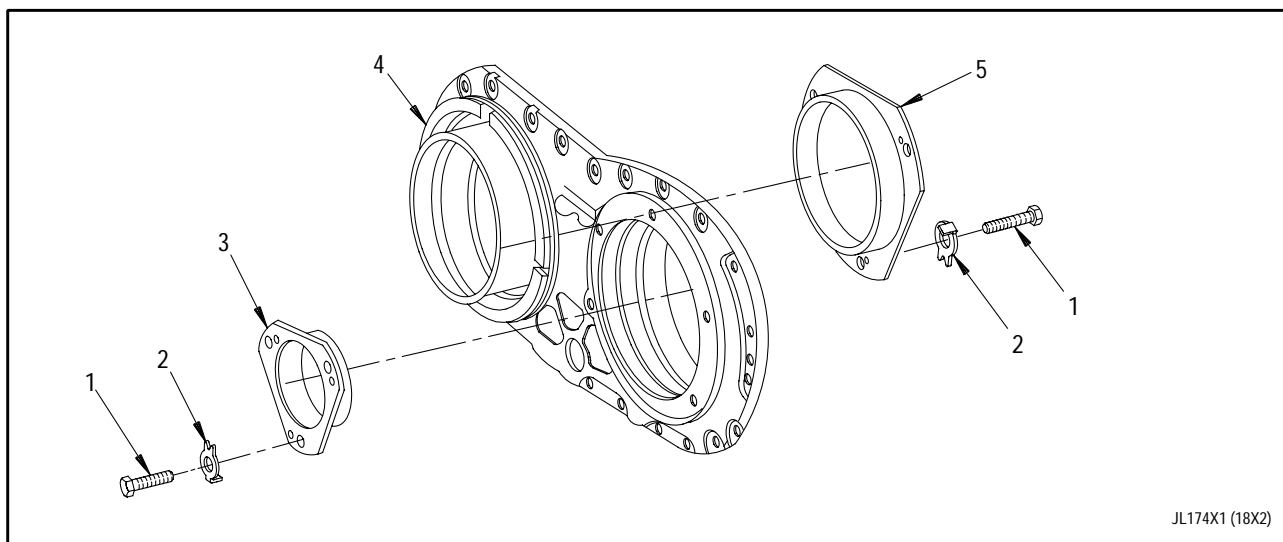
- a. Heat gearbox front housing 265° to 285°F (129° to 140°C).
- b. Chill deaerator bearing outer race(3, figure 1) and spur bevel gearshaft bearing outer race(5).
- c. Install deaerator bearing outer race(3) as follows:
  - (1) Install PWA 50403 aligning pins into retaining bolt holes in preheated front housing.

- (2) Use PWA 50637 puller to seat bearing, as follows:

- (a) Position chilled bearing race on studded puller plate and position on alignment pins.
- (b) Install bracing plate on inside face of front housing and pilot stud of puller plate through it.
- (c) Secure plate with nut detail. Using two standard wrenches, hold stud detail and, using wrenching action, tighten nut detail and pull race into position. Remove tools.

- d. Install spur bevel gearshaft bearing outer race(5) as follows:

- (1) Install PWA 50403 aligning pins into retaining bolt holes in preheated front housing.
- (2) Use PWA 50639 puller to seat bearing, as follows:
  - (a) Position chilled bearing race on studded puller plate and position on alignment pins.



Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Bolt	Lubricating oil	65 to 85	-
2.	PN 171752 key washer	-	-	-
3.	Gearbox deaerator impeller shaft bearing outer race	-	-	-
4.	Gearbox (front) housing	-	-	-
5.	Gearbox drive spur bevel gearshaft bearing outer race	-	-	-

**Figure 1. Gearbox Drive Spur Bevel Gearshaft and Deaerator Impeller Shaft Bearing Outer Races - Installation into Gearbox (Front) Housing**

- (b) Install bracing plate on outside face of front housing and pilot stud of puller plate through it.
- (c) Secure plate with nut detail. Using two standard wrenches, hold stud detail and, using wrenching action, tighten nut detail and pull race into position. Remove tools.
- e. After front housing has cooled, install key washers with prebent tabs inserted into locking holes on outer races. Install bolts into bolt holes on both outer races. Torque. Inspect prebent tabs to ensure they are still installed in holes. Bend remaining tabs to secure.

**3. GEARBOX SPUR GEAR AND GEARBOX  
IDLER GEARSHAFT ASSEMBLY - ASSEMBLY  
AND INSTALLATION INTO GEARBOX (FRONT)  
HOUSING.**

(See Figure 2.)

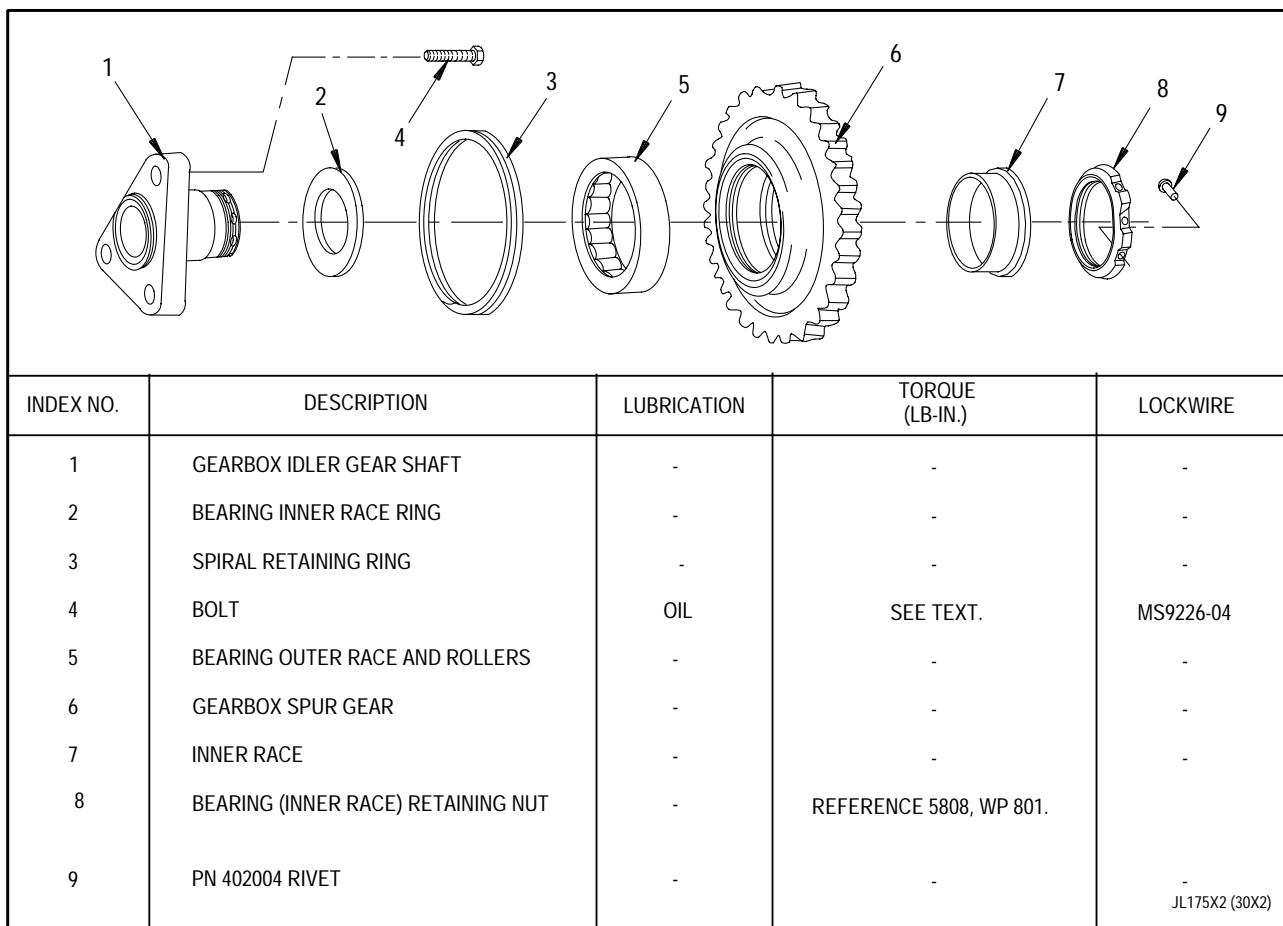
- a. Install shaft(1, figure 2) using lockwire to lock bolt(4) instead of key washer as follows:

- (1) Position gearbox front housing on PWA 56502 base with large diameter hole down and triangular pad for mounting shaft up.
- (2) Install three PWA 50876 alignment pins in triangular pad.

**NOTE**

Do not heat entire gearbox front housing.

- (3) Heat ID of triangular mounting pad local area only, 280° to 300°F (138° to 149°C) and chill shaft(1).
- (4) Position shaft(1) over alignment pins and using PWA 50428 drift and standard arbor press, press shaft into gearbox housing.



**Figure 2. Gearbox Spur Gear and Gearbox Idler Gearshaft Assembly - Assembly and Installation**

- (5) While gearbox housing is still hot, remove alignment pins and install bolts(4) and torque 70 to 80 pound-inches.
- (6) After gearbox housing has cooled, loosen bolts(4), and torque as follows:
  - (a) Loosen bolts one at a time.
  - (b) Torque bolts 70 to 80 pound-inches.
  - (c) After all bolts have been torqued, inspect shaft seating to ensure 0.001 inch feeler gage will not pass between triangular pad and gearbox front housing.
  - (d) Lockwire bolts using PN MS9206-04 (0.032 inch) wire.
  - (e) Inspect shaft for scratches and burrs caused by torquing bolts.

- b. Install bearing outer race and rollers(5) in gear(6) as follows:

- (1) Place gear in hot oil bath and heat 280° to 300°F (138° to 149°C).
- (2) Place gear(6) on PWA 50429 base.
- (3) Position outer race with rollers(5), serial number down, on gear and using PWA 50402 drift and standard arbor press, press race into gear.

**NOTE**

If serial number will be covered by retaining ring, copy number on tag and retain with assembly until bearing is completely built.

- (4) Install spiral retaining ring(3) to secure race in gear.



- c. Install gear and bearing details on idler gearshaft(1) as follows:
- (1) Check that serial numbers on both sections of inner race(2 and 7) match and install inner race ring(2) on shaft(1) with serial number down.
  - (2) Place inner race(7) in bearing outer race and rollers(5) on side opposite spiral retaining ring.
  - (3) Place gear(6) and bearing assembly in hot oil bath and heat 280° to 300°F (138° to 149°C).
  - (4) Place gear and bearing assembly, retaining ring side of gear down, over shaft. Use PWA 50422 drift and standard arbor press, press gear and bearing assembly onto shaft.
  - (5) After gear and bearing assembly have cooled, install bearing retaining nut(8). Using PWA 50430 wrench, torque nut.
  - (6) Insert retaining rivet(9), manufactured head inside shaft. Secure rivet using PWA 50425 riveter.



**WORK PACKAGE****TECHNICAL PROCEDURES****GEARBOX (REAR) HOUSING-PARTIAL ASSEMBLY****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 18

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2 . . . . .	23	10 . . . . .	6	15 . . . . .	0
3 - 4 . . . . .	6	11 - 12 . . . . .	0	16 - 18 . . . . .	5
5 - 6 Deleted . . . . .	6	13 . . . . .	6	19 Added . . . . .	5
7 - 8 . . . . .	6	14 . . . . .	23	20 Blank Added . . . . .	5
9 . . . . .	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O. 2-1-111

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Compound, antigalling (PWA 36545)	Everlube 382
Lockwire	MS9226-04
Oil, lubricating	MIL-L-7808
Primer, wet zinc chromate	TT-P-1757

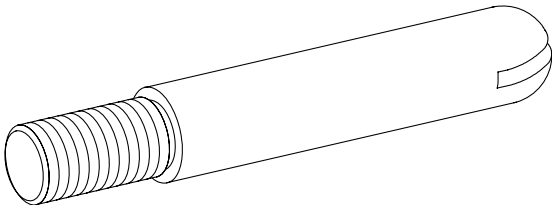
EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Key washer	171752	6
Key washer	4014749	2
Packing	AS3209-008	2
Packing	ST1000-111	1
Packing	ST1000-024	2
Packing	ST1001-04	1
Packing	ST1050-008	2
Packing	ST1050-009	1
Packing	ST1050-011	2
Packing	ST1051-04	2

### APPLICABLE SUPPORT EQUIPMENT

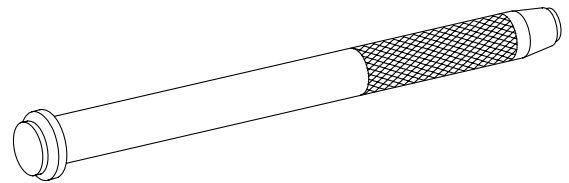
Paragraph	Function - Tool Nomenclature	Tool Number
2	Gearbox Deaerator Impeller Shaft and Gearbox Spur Gearshaft Roller Bearing Outer Race - Installation	
	Pin, Alignment (3) - - - - -	PWA 50403
	Drift, Oil pump drive idler shaft roller bearing outer race - - - - -	PWA 50452
	Pusher, Deaerator impeller shaft ball bearing to housing - - - - -	PWA 57104
3	Gearbox Spur Gearshaft - Installation	
	Drift, Housing Gearbox Bearing Oil Pump Idler Gear (Locally Manufactured) - - - - -	PWA 57045
	Tool, F-100 gearbox dummy - - - - -	SAALC 8441775
4	Gearbox (Rear) Housing Installation of Fittings and Nozzles	
	Pin, Alignment (3) - - - - -	PWA 50876
	Puller, Gearbox bearing transfer tube - - - - -	PWA 53363
	Drift - - - - -	PWA 55536
		or SAALC 8620284
	Drift (Locally manufactured) - - - - -	PWA 57118

### ILLUSTRATED SUPPORT EQUIPMENT



PWA 50403 -C

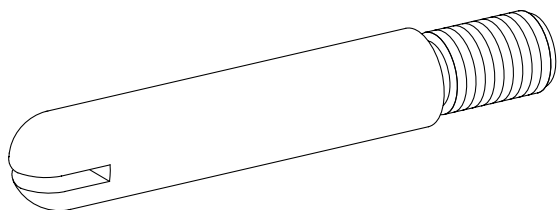
Figure T1. PWA 50403 Pin



PWA 50452 -C

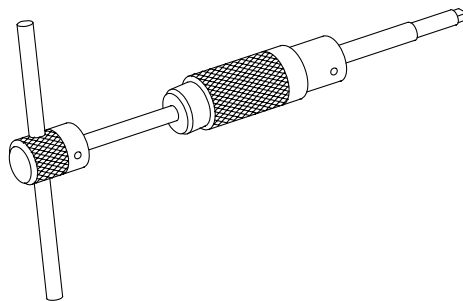
Figure T2. PWA 50452 Drift

**ILLUSTRATED SUPPORT EQUIPMENT (continued)**



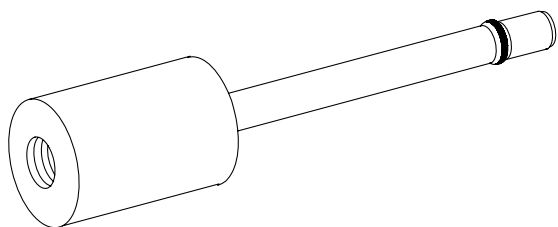
PWA 50876 -C

**Figure T3. PWA 50876 Pin**



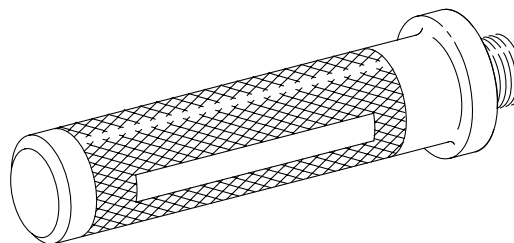
PWA 53363 -C

**Figure T4. PWA 53363 Puller**



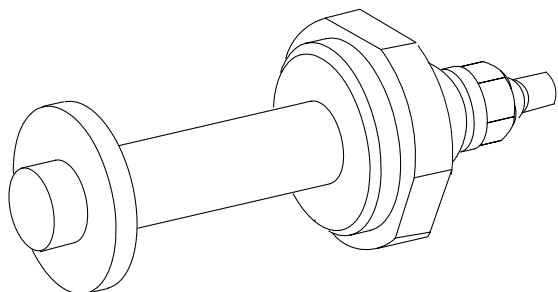
PWA 55536 -C

**Figure T5. PWA 55536 Puller**



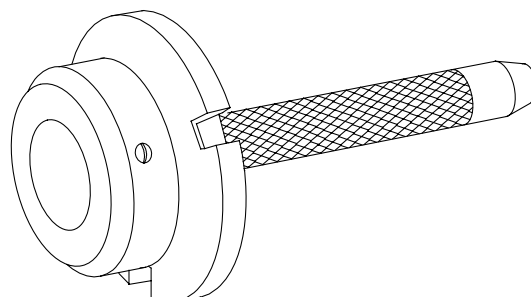
PWA 57045 -C

**Figure T6. PWA 57045 Drift**



PWA 57104 -C

**Figure T7. PWA 57104 Pusher**



PWA 57118 -C

**Figure T8. PWA 57118 Drift**

Pages 5 and 6 deleted.

**1. INTRODUCTION.**

- a. This work package contains instructions for partial assembly and air flow test of the gearbox (rear) housing.

## 2. GEARBOX DEAERATOR IMPELLER SHAFT AND GEARBOX SPUR GEARSHAFT ROLLER BEARING OUTER RACE - INSTALLATION.

(See Figure 1.)

### WARNING

Wear insulated protective gloves when handling heated gearbox housing.

### NOTE

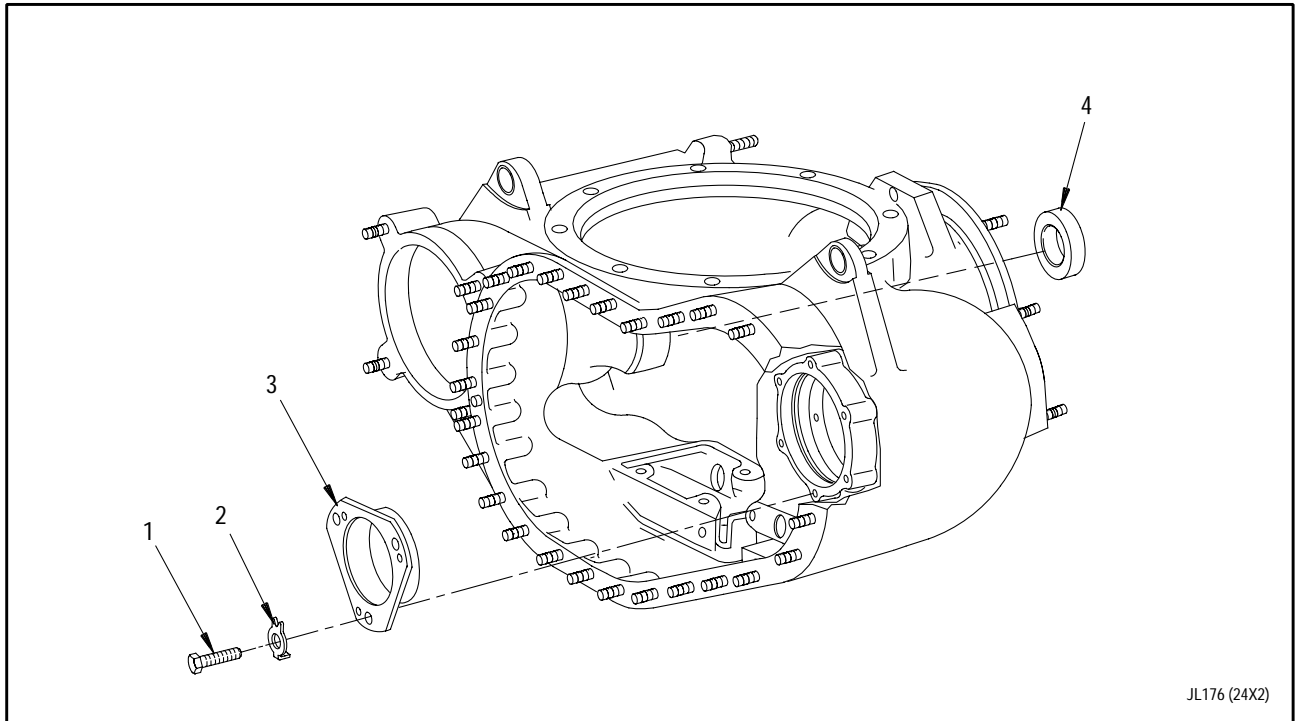
To install these parts, housing shall be heated.

- a. Heat gearbox housing locally at deaerator ball bearing location 300° to 320°F (149° to 160°C).
- b. Install bearing(3, figure 1) as follows:
  - (1) Install three PWA 50403 guide pins in bearing retaining bolt holes of housing.
  - (2) Use PWA 57104 pusher to seat bearing as follows:
    - (a) Position PWA 57104 pusher detail-1 center bolt through bearing with plate detail of bolt located on bearing flange.
    - (b) Install detail-2 locator (bracing plate) on detail-1 center bolt and gearbox dome opening.

- (c) Secure detail-2 locator with detail-3 nut. Use two standard wrenches. Hold center bolt detail with one wrench and tighten nut detail with second wrench until bearing is seated. Remove tools.

- c. Install key washers(2) with prebent tabs into locking holes on bearing(3). Install bolts(1). Torque 65 to 85 pound-inches. Inspect prebent tabs to ensure they are still installed in holes. Bend remaining tabs to secure.
- d. Install roller bearing outer race(4) as follows:
  - (1) Verify serial number of roller bearing outer race against serial number on details installed on mating idler spur gearshaft.
  - (2) Locally heat housing 300° to 320°F (149° to 160°C) at idler spur gearshaft roller bearing location.
  - (3) Using mallet and PWA 50452 drift, install roller bearing outer race, serial number down, into housing.





JL176 (24X2)

Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Bolt	Lubricating oil	65 to 85	-
2.	Key washer	-	-	-
3.	Gearbox deaerator impeller shaft bearing	-	-	-
4.	Gearbox spur (oil pump drive idler) gearshaft roller bearing outer race	-	-	-

**Figure 1. Gearbox Deaerator Impeller Shaft and Gearbox Spur Gearshaft Roller Bearing Outer Race - Installation**

### 3. GEARBOX SPUR GEARSHAFT AND BALL BEARING HOUSING - INSTALLATION.

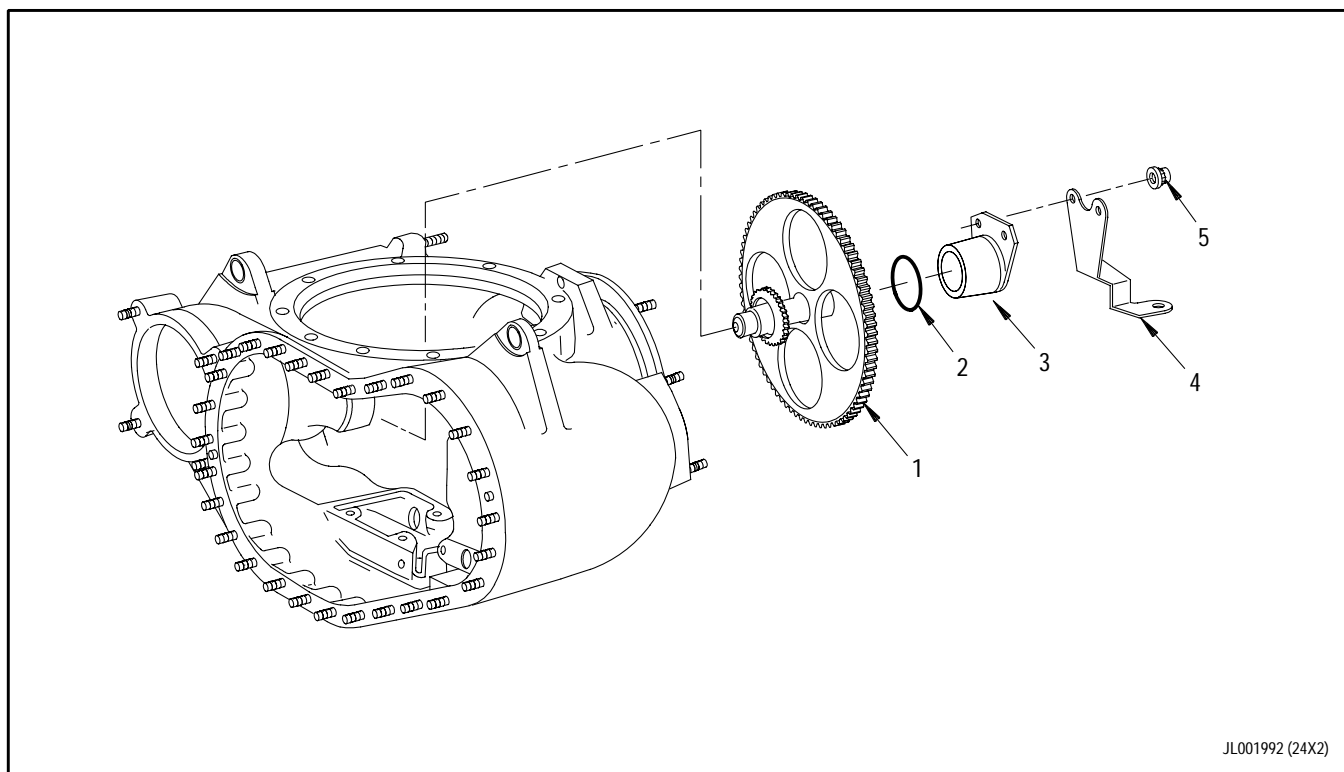
(See Figure 2.)

- a. Verify serial numbers of outer race installed in (rear) housing and inner race and rollers on gearshaft are identical.

#### NOTE

It may be helpful to retain rollers with small elastic band. Ensure band is removed.

- b. Install gearshaft(1, figure 2) by cocking it sideways, slipping ball bearing end into ball bearing housing opening of cavity; then slipping it down so rollers mate with previously installed outer race.
- c. Visually inspect oil passages in housing(3) prior to installation.
- d. Heat gearbox housing locally in bearing housing area 300° to 320°F (149° to 160°C).
- e. Coat PN ST1000-024 packing(2) with MIL-L-7808 lubricating oil.
- f. Install packing(2) onto ball bearing housing(3).
- g. Install housing(3) by aligning holes in flange of housing with studs on gearbox (rear) housing. Ensure ball bearing aligns with ball bearing housing(3) as housing is pushed into position.
- h. Push housing(3) into position by hand. Using work nuts (non-locking), seat bearing housing to gearbox housing. Cool to room temperature and remove work nuts.
- i. Position bracket(4) onto two studs closest to bottom of gearbox.
- j. Coat nuts(5) with PWA 36545 antigalling compound.
- k. Secure housing(3) and bracket(4) with nuts(5).
- l. Torque nuts 54 to 60 pound-inches.



JL001992 (24X2)

Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Gearbox spur (oil pump drive idler) gearshaft	-	-	-
2.	PN ST1000-024 Packing	MIL-L-7808	-	-
3.	Ball bearing housing	-	-	-
4.	Bracket	-	-	-
5.	Nut	PWA 36545	54 to 60	-

**Figure 2. Gearbox Spur Gearshaft - Installation**

#### 4. GEARBOX (REAR) HOUSING - INSTALLATION OF FITTINGS AND NOZZLES FOR FLOW TEST.

(See Figures 3 and 4.)

- a. Flow check retaining plate(1, figure 3). Refer to T.O. 2J-F100-53-1, WP 026 00.
- b. Install PWA 50876 aligning pins in retaining plate bolt holes of gearbox housing.
- c. Install retaining plate(1) as follows:
  - (1) Heat mating ID of gearbox housing in local area only, 280° to 300°F (138° to 149°C) and chill retaining plate(1).
- (2) Locate retaining plate(1) on aligning pins so transfer tube port will align with tube(5) when installed.
- (3) Seat plate(1) in housing using PWA 57118 drift. Ensure alignment of hole in drift and retaining plate pin. Do not remove aligning pins.
- d. Comply with step e, if installing (threaded) transfer tube(5). Comply with step f, if installing (unthreaded) transfer tube(5).

#### Legend for figure 3

Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Gearbox bearing retaining plate assembly	-	-	-
2.	Oil inlet tube-to-boss straight adapter	See text.	65 to 75	-
3.	Packing	Lubricating oil	-	-
4.	Packing	Lubricating oil	-	-
5.	Gearbox bearing packing transfer tube	-	-	-
6.	Fluid passage bolt	Lubricating oil	40 to 50	-
7.	Packing	Lubricating oil	-	-
8.	Gearbox bearing nozzle	-	-	-
9.	Key washer	-	-	-
10.	Hex screw	Lubricating oil	24 to 36	-
11.	Packing	Lubricating oil	-	-
12.	Oil nozzle	-	-	-

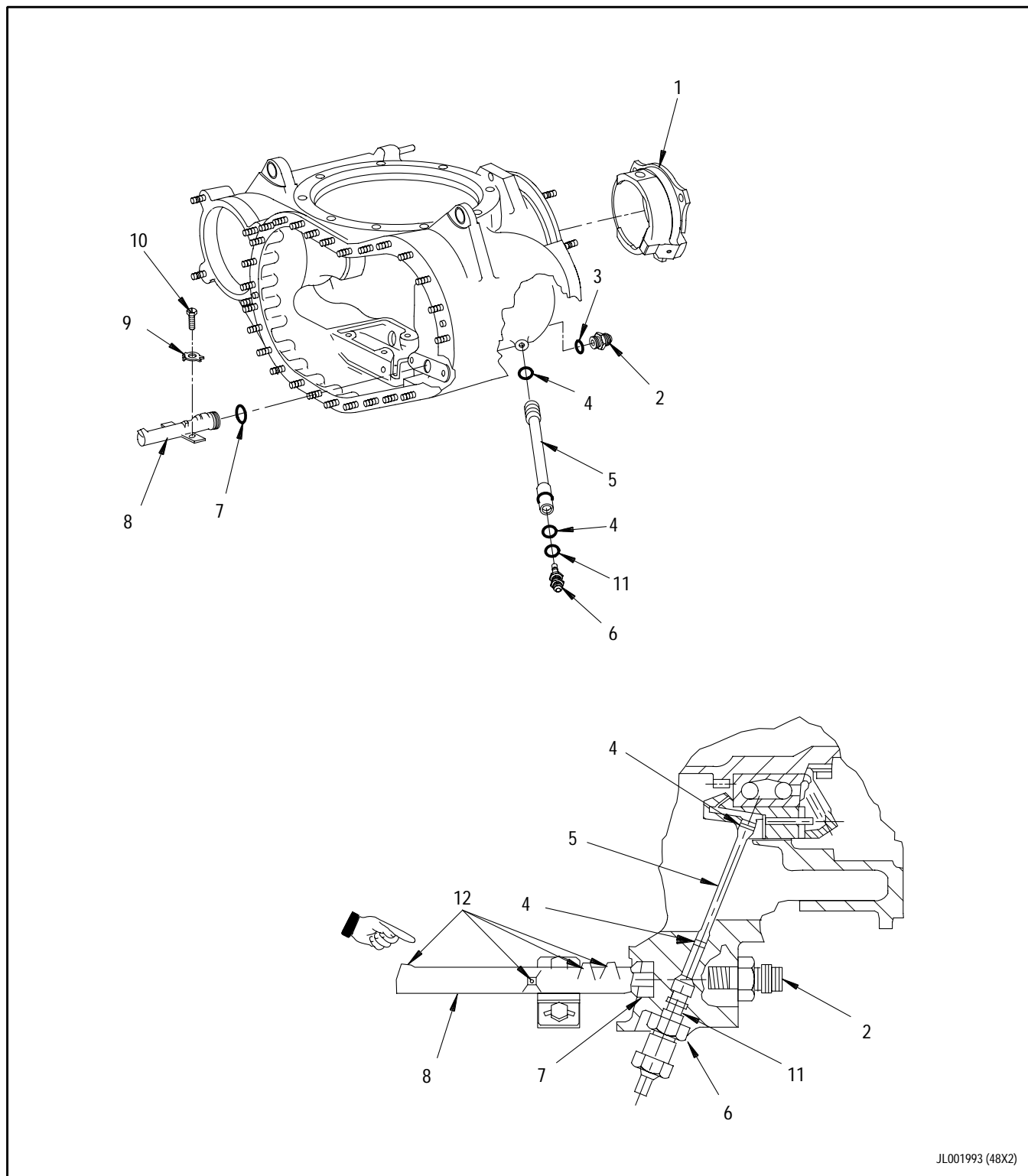


Figure 3. Gearbox (Rear) Housing - Installation of Fittings and Nozzles for Flow Test

e. Install threaded transfer tube(5) as follows:

- (1) Coat PN ST1050-008 packing(4) with MIL-L-7808 lubricating oil.
- (2) Install two packings(4) on transfer tube(5).
- (3) Install PWA 55536 drift(2, figure 4) into threaded end of PWA 53363 puller(1), and install drift into large diameter end of tube(1).
- (4) Install transfer tube(1) into gearbox opening and use light knocker action to seat tube.
- (5) Install packing(11, figure 3) on fluid passage bolt(6), and install bolt in gearbox. Torque bolt.

f. Install (unthreaded) transfer tube(5) as follows:

- (1) Visually inspect tube(5) for obstructions prior to installation.
- (2) Coat PN ST1000-008 packing(4) with MIL-L-7808 lubricating oil.

(3) Install packing(4) on transfer tube(5).

(4) Install PWA 55536 drift into larger diameter end of tube(5).

(5) Install transfer tube(5) into gearbox opening and seat tube using light knocker action.

g. Install gearbox bearing nozzle(8) as follows:

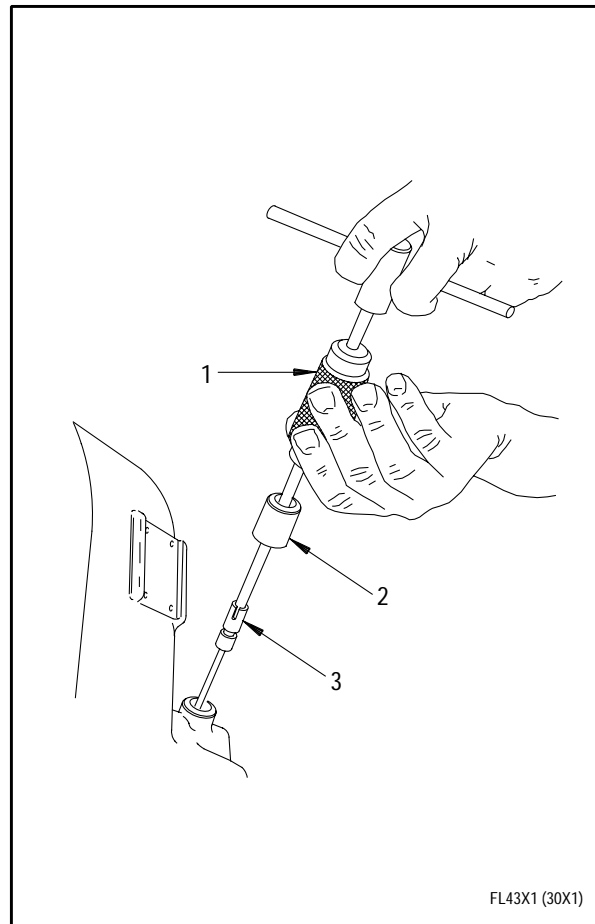
(1) Flow check refer to T.O. 2J-F100-53-1 WP 026 00.

(2) Coat PN ST1000-11 packing(7) with MIL-L-7808 lubricating oil.

(3) Install packing(7) onto gearbox bearing nozzle(8).

(4) Install nozzle(8) into gearbox opening. Secure with screws(10) and key washers(9).

(5) Torque screws 24 to 36 pound-inches. Inspect prebent tabs to ensure installation in holes. Bend remaining tabs to secure.



**Figure 4. Gearbox Bearing Transfer Tube - Installation**

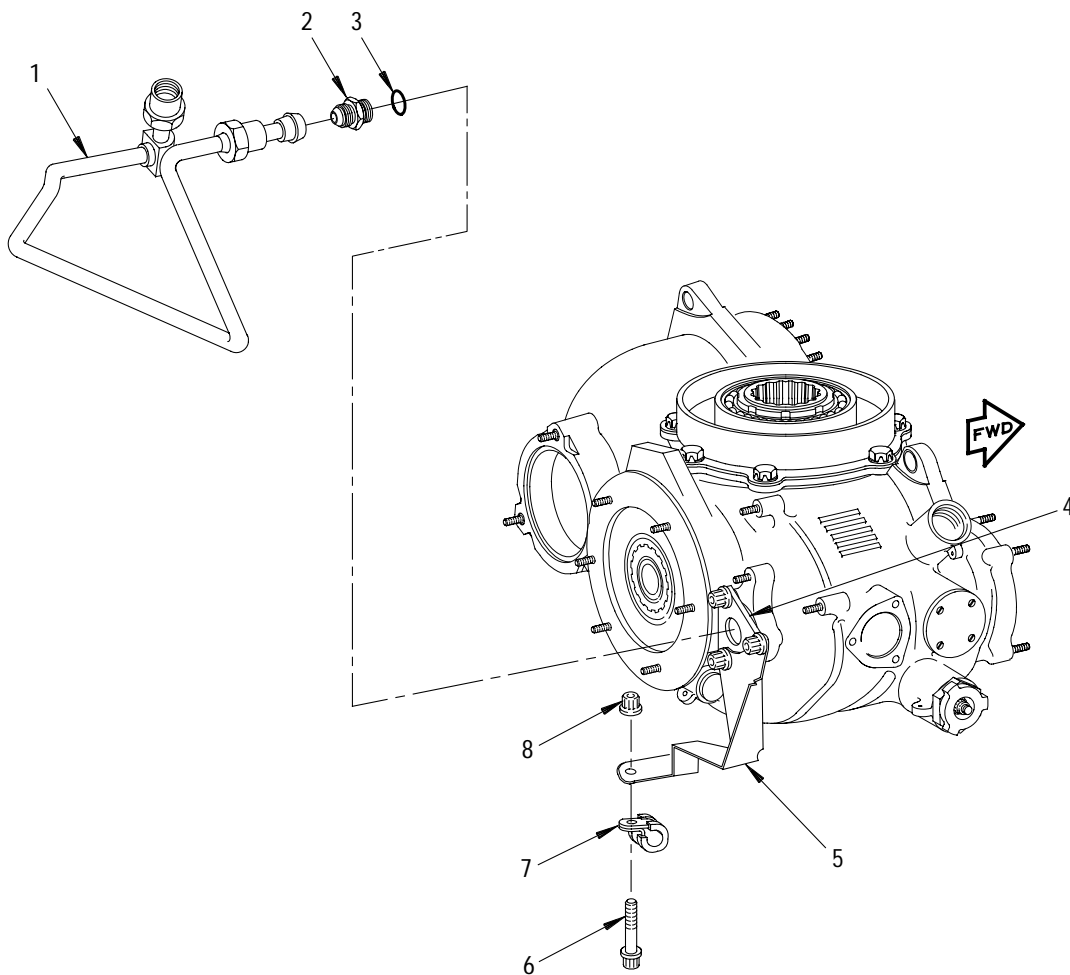
1. PWA 53363 gearbox bearing transfer tube puller
2. PWA 55536 drift
3. Gearbox bearing transfer tube

h. Apply wet zinc chromate primer to contact surface of flange and threads of adapter(2). Refer to T.O. 2J-F100-53-1, SWP 097 10 (SPOP 157). Install adapter(2) and packing(3). Torque 65 to 75 pound-inches.

# **10. OIL PRESSURE TUBE (PN 4057614 - 01) - INSTALLATION.**

(See Figure 5.)

- a. Coat packing(3) with MIL-L-7808 lubricating oil.
- b. Install packing(3) onto adapter(2).
- c. Install adapter(2) into bearing housing(4). Torque adapter.
- d. Install oil pressure tube(1) to adapter(2) at bearing housing(4). Torque tube nuts and lockwire.
- e. Install clamp(7) on pressure tube(1) and secure to bracket(5) with bolt(6) and nut(8). Torque nut.



JL001994 (36X2)

**Figure 5. Oil Pressure Tube (PN 4057614 - 01) - Installation**



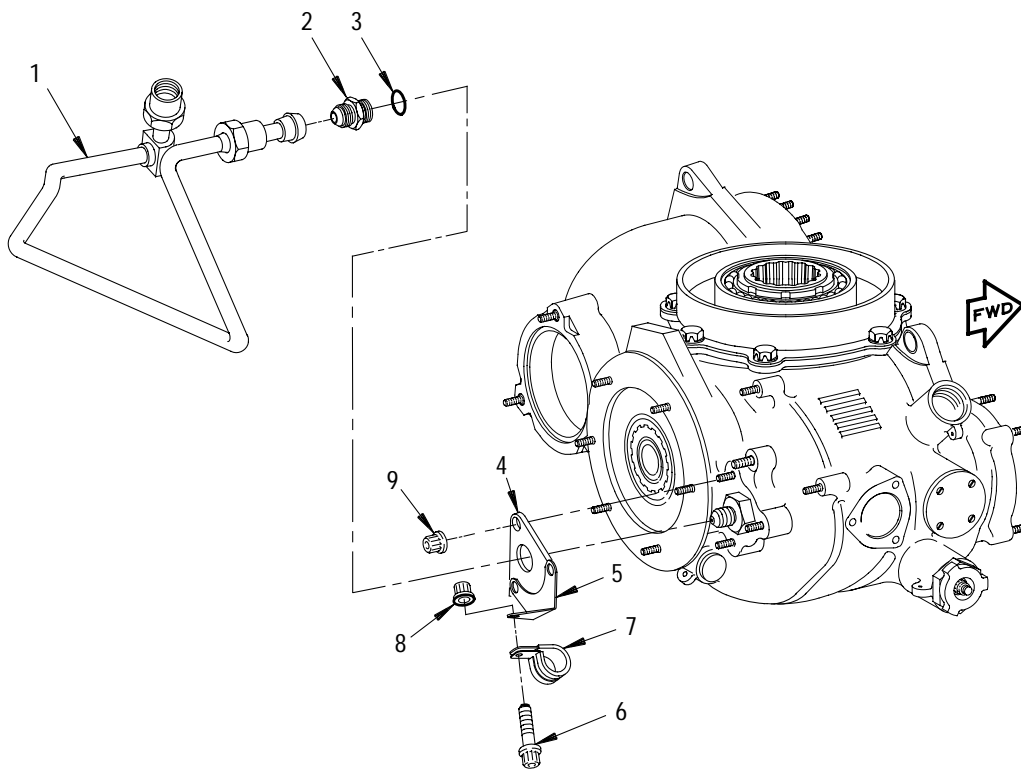
## Legend for figure 5

Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Oil pressure tube	-	90 to 100	MS9226-04
2.	Adapter	Lubricating oil	65 to 75	-
3.	Packing	Lubricating oil	-	-
4.	Ball bearing housing	-	-	-
5.	Bracket	-	-	-
6.	Bolt	Lubricating oil	-	-
7.	Clamp	-	-	-
8.	Nut	-	27 to 30	-

# **11. OIL PRESSURE TUBE (PN 4081108) - INSTALLATION.**

(See Figure 6.)

- a. Coat packing(3) with MIL-L-7808 lubricating oil.
- b. Install packing(3) onto adapter(2).
- c. Install adapter(2) into bearing housing(4). Torque adapter.
- d. Install oil pressure tube(1) to adapter(2) at bearing housing(4). Torque tube nuts and lockwire.
- e. Install clamp(7) on pressure tube(1) and secure to bracket(5) with bolt(6) and nut(8). Torque nut.



32115 (36X2)

**Figure 6. Oil Pressure Tube (PN 4081108) - Installation**

## Legend for figure 6

Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Oil pressure tube	-	130 to 140	MS9226-04
2.	Adapter	Lubricating oil	65 to 75	-
3.	Packing	Lubricating oil	-	-
4.	Ball bearing housing	-	-	-
5.	Bracket	-	-	-
6.	Bolt	Lubricating oil	-	-
7.	Clamp	-	-	-
8.	Nut	-	27 to 30	-



**WORK PACKAGE****TECHNICAL PROCEDURES**

**GEARBOX (REAR) HOUSING  
(INCORPORATING PTO DUPLEX BEARING  
WITH SPLIT INNER RACE) -**

**FINAL ASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 26

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 - 2 . . . . .	22	8 . . . . .	9	14A Added . . . . .	2
3 - 4 . . . . .	20	8A - 8B . . . . .	14	14B Blank Added . . . . .	2
4A Added . . . . .	16	9 - 11 . . . . .	22	15 - 16 . . . . .	2
4B Blank Added . . . . .	16	12 . . . . .	11	17 . . . . .	20
5 . . . . .	16	13 . . . . .	0	18 . . . . .	16
6 . . . . .	20	14 . . . . .	11	19 . . . . .	0
7 . . . . .	16			20 Blank . . . . .	0

## REFERENCE MATERIAL REQUIRED

Title	Number
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Gearbox Module - Table of Limits and Clearance Charts - -	WP 801 00

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
COMPOUND, SEALING (PWA 36000-3 OR PWA 36000-2)	HYLOMAR PL-32
CRAYON, SILVER MARKING METAL	COLORBRITE SILVER NO. 2101
LUBRICANT, SEALING RING (PWA 36500)	ULTRACHEM ASSEMBLY FLUID NO. 1
OIL, LUBRICATING	MIL-L-7808
WIRE-SAFETY, (0.032 DIA.)	MS9226-04

## EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
KEY WASHER	171752	12
KEY WASHER	4014749	2
KEY WASHER	4062030	1
PACKING	AS3209-008	2
PACKING	ST1000-163	1
PACKING	ST1000-164	1
PACKING	ST1050-009	1
PACKING	ST1050-011	1
WASHER-KEY	4027238	1
WASHER	MS9549-10	2

## APPLICABLE SUPPORT EQUIPMENT

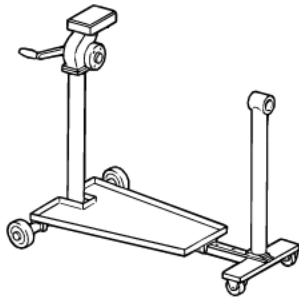
Paragraph	Function - Tool Nomenclature	Tool Number
2	GEARBOX SPUR (OIL PUMP DRIVEIDLER) GEARSHAFT AND SCAVENGE PUMP - BACKLASH MEASUREMENT IN GEARBOX (REAR)HOUSING	
	STAND, MAIN GEARBOX - - - - -	PWA 57412
		OR
	STAND, MAIN GEARBOX - - - - -	PWA 27606
	HOLDER, GEARBOX SCAVENGE PUMP TO GEARBOX - - - - -	PWA 50482
	HOLDER, OIL PUMP DRIVEGEAR - - - - -	PWA 50528
	ADAPTER, OIL PUMP IDLER GEAR - - - - -	PWA 50529
3	GEARBOX BEVEL GEARSHAFTASSEMBLY, GEARBOX SCAVENGE TUBES, AND GEARBOX SUMP COVER ASSEMBLY - INSTALLATION	
	PINS, ALIGNING - - - - -	PWA 50876

## APPLICABLE SUPPORT EQUIPMENT (continued)

Paragraph	Function - Tool Nomenclature	Tool Number
4	GEARBOX DRIVE SPUR BEVELGEARSHAFT AND BEARING ASSEMBLY - INSTALLATION	
	STAND, MAIN GEARBOX - - - - -	PWA 57412 OR
	STAND, MAIN GEARBOX - - - - -	PWA 27606
	ADAPTER, HOLDING, MAIN GEARBOX BUILD AND TRANSFER -	PWA 50473
	PULLER, BEVEL GEARSHAFT DRIVE BEARING INNER RACE UPPER - - - - -	PWA 57050
	BASE, PTO GEARSHAFT BEARING INNER RACE FRONT HALF -	PWA 50648
	DRIFT, PTO GEARSHAFT BEARING INNER RACE FRONT HALF -	PWA 57047
	SUPPORT, PTO GEARSHAFT DUPLEX BEARING - - - - -	PWA 53825
	GUIDE, GEARBOX DRIVESHAFT TO BEARING RETAINING PLATE - - - - -	PWA 57368 OR
	GUIDE, GEARBOX DRIVESHAFT TO BEARING RETAINING PLATE - - - - -	FLD 131316
	PUSHER, DUPLEX BEARING, GEARBOX DRIVESHAFT - - - - -	SA-ALC 8750312 OR
	PUSHER, DUPLEX BEARING, GEARBOX DRIVESHAFT - - - - -	PWA 57367
	PINS, ALIGNING - - - - -	PWA 50611
	ADAPTER, TORQUE, BEVEL GEARSHAFT DRIVE DUPLEX BEARING NUT - - - - -	PWA 57049
	WRENCH, TORQUE, BEVEL GEARSHAFT DUPLEX BEARING NUT -	PWA 57048
	ADAPTER, GEARBOX DRIVE BEVEL GEARSHAFT KEYWASHER - -	PWA 56805
5	DEAERATOR IMPELLER SHAFT AND DEAERATOR IMPELLER ASSEMBLY - INSTALLATION	
	CRIMPER, DEAERATOR IMPELLER SHAFT BALL BEARING INNER RACE KEY WASHER - - - - -	PWA 57378
	PULLER, DEAERATOR IMPELLER SHAFT SUBASSEMBLY INTO BALL BEARING - - - - -	PWA 55823
	WRENCH, DEAERATOR IMPELLER SHAFT BALL BEARINGS RETAINING NUT - - - - -	PWA 57108
	HOLDER, IGNITION ALTERNATOR DRIVE SHAFT - - - - -	PWA 56685
	WRENCH, DEAERATOR IMPELLER SHAFT BALL BEARINGS RETAINING NUT - - - - -	PWA 55824

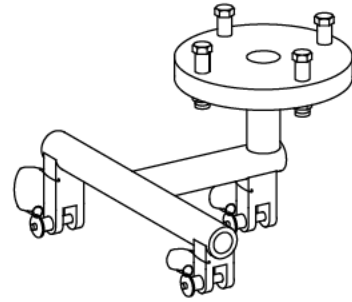


ILLUSTRATED SUPPORT EQUIPMENT



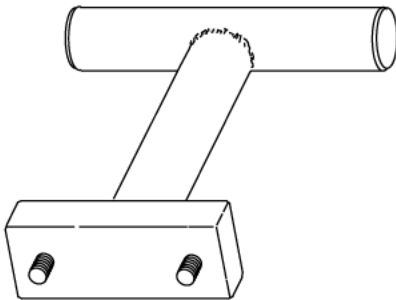
PWA 27606 -C

Figure T1. PWA 27606 STAND



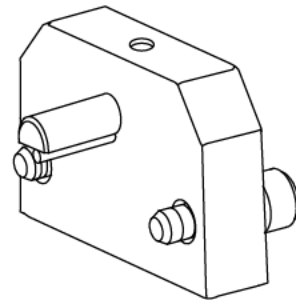
PWA 50473 -C

Figure T2. PWA 50473 ADAPTER



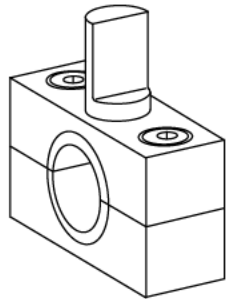
PWA 50482 -C

Figure T3. PWA 50482 HOLDER



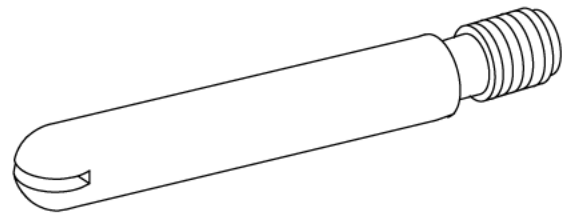
PWA 50528A -C

Figure T4. PWA 50528 HOLDER



PWA 50529 -C

Figure T5. PWA 50529 ADAPTER

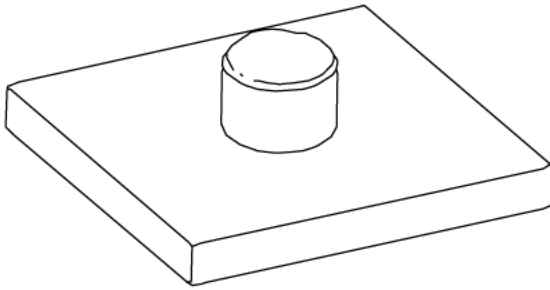


PWA 50611 -C

Figure T6. PWA 50611 PINS

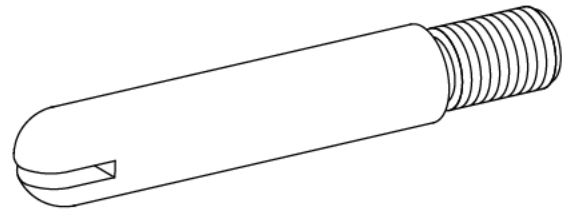


ILLUSTRATED SUPPORT EQUIPMENT (continued)



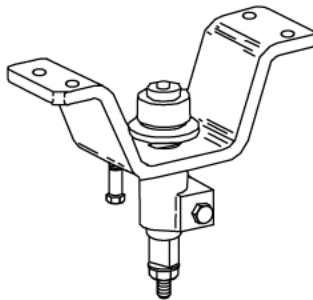
PWA 50648 -C

Figure T7. PWA 50648 BASE



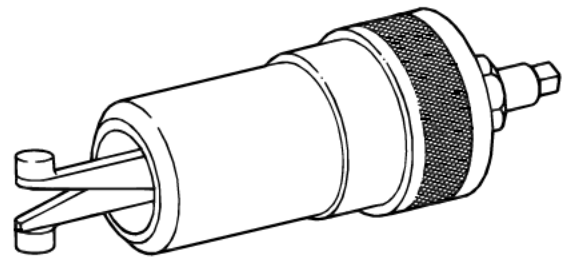
PWA 50876 -C

Figure T8. PWA 50876 PINS



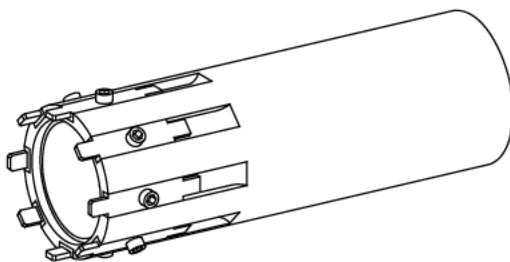
PWA 53825 -C

Figure T9. PWA 53825 SUPPORT



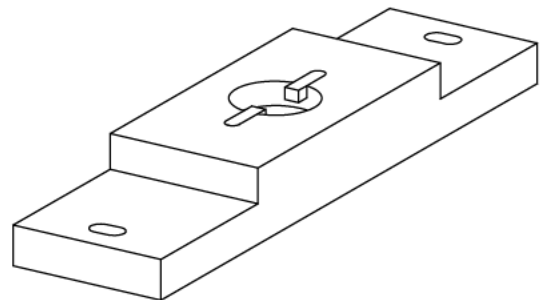
PWA 55823 -C

Figure T10. PWA 55823 PULLER



PWA 55824 -C

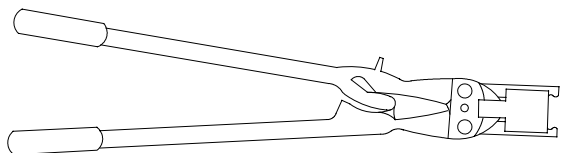
Figure T11. PWA 55824 WRENCH



PWA 56685 -C

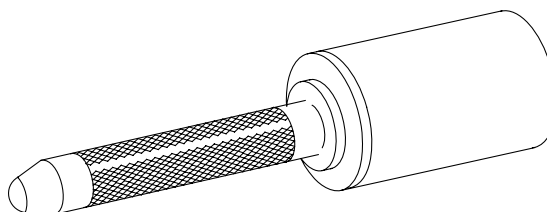
Figure T12. PWA 56685 HOLDER

ILLUSTRATED SUPPORT EQUIPMENT (continued)



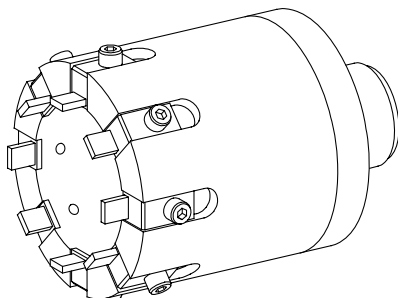
PWA 56805 -C

**Figure T13. PWA 56805 ADAPTER**



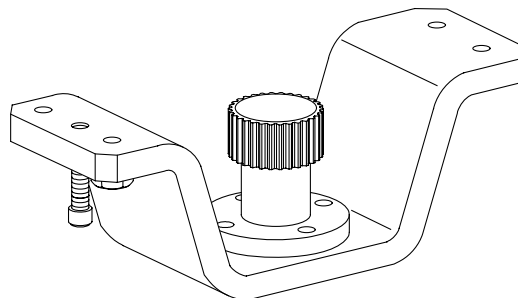
PWA 57047 -C

**Figure T14. PWA 57047 DRIFT**



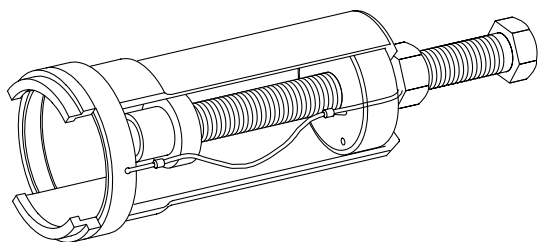
PWA 57048 -C

**Figure T15. PWA 57048 WRENCH**



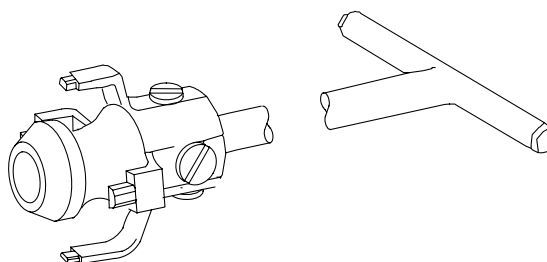
PWA 57049 -C

**Figure T16. PWA 57049 ADAPTER**



PWA 57050 -C

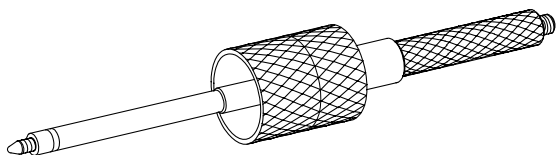
**Figure T17. PWA 57050 PULLER**



PWA 57108 -C

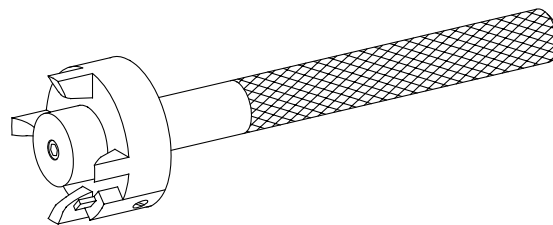
**Figure T18. PWA 57108 WRENCH**

ILLUSTRATED SUPPORT EQUIPMENT (continued)



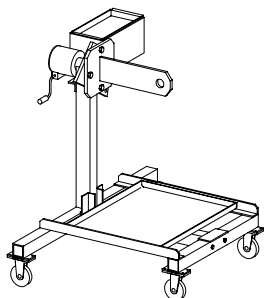
PWA 57368 -C

Figure T19. PWA 57368 GUIDE



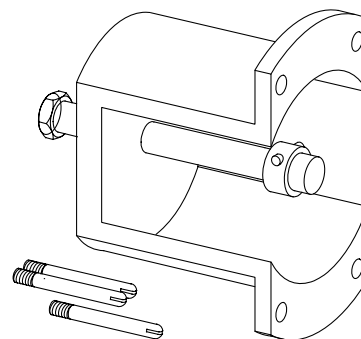
PWA 57378 -C

Figure T20. PWA 57378 CRIMPER



PWA 57412 -C

Figure T21. PWA 57412 STAND



SAALC 8750312 -C

Figure T22. SA-ALC 8750312 PUSHER

**1. INTRODUCTION.**

**NOTE**

Gearbox rear housings  
incorporating PTO gearshaft  
duplex bearing with one piece  
inner race shall be assembled  
per SWP 703 01.

- a. This work package contains  
instructions for installation of  
gearshaft subassemblies,  
bearings, and associated parts  
into gearbox (rear) housing to  
complete final assembly of  
housing incorporating PTO  
gearshaft duplex bearing with  
two piece split inner race.  
Partial assembly and air flow  
test of housing is completed in  
WP 702 00.

## 2. GEARBOX SPUR (OIL PUMP DRIVE IDLER) GEARSHAFT AND SCAVENGE PUMP - BACKLASH MEASUREMENT IN GEARBOX (REAR) HOUSING.

- a. Install gearbox housing into PWA 57412 build stand.
- b. Install gearbox No. 2 and 3 bearing scavenge pump assembly as follows:
  - (1) Using detail bolts, fasten PWA 50482 holder to scavenge pump.
  - (2) Partially insert pump into cavity of gearbox housing.
  - (3) When gear clears housing wall, twist pump 1/4 turn clockwise.
  - (4) Locate scavenge pump on pin in gearbox housing and push to seat.
- c. Make backlash measurement as follows:
  - (1) Position PWA 50528 holder so holder detail engages main oil pump drive splined socket of scavenge pump. Secure plate detail to scavenge pump housing with detail screws.



PWA 50529 adapter shall be fastened firmly to gearshaft so it does not slip and cause damage to gearshaft or result in inaccurate dial indicator readings during backlash measurement.

- (2) Install PWA 50529 adapter on gearbox spur gearshaft between two gears on gearshaft with detail block having L-shaped piece facing into center of gear housing and scribe line on L-shaped piece facing large circular opening.

### NOTE

Dial indicator with parallel bars to clear housing studs is recommended.

- (3) Using dial indicator setup, position indicator point on scribe line of tool.
- (4) Rock gear back and forth and record amount of backlash. Refer to WP 801 00, Reference 5707.
- (5) Remove PWA 50528 holder and PWA 50529 adapter.
- d. Remove scavenge pump as follows:
  - (1) Pull scavenge pump forward to clear mounting pin in gearbox housing.
  - (2) Twist scavenge pump approximately 1/4 turn counterclockwise and pull scavenge pump from housing.
- e. Remove gearbox rear housing from PWA 57412 build stand.

### 3. GEARBOX BEVEL GEARSHAFT ASSEMBLY, GEARBOX SCAVENGE TUBES, AND GEARBOX SUMP COVER ASSEMBLY - INSTALLATION.

(See Figure 1.)

#### NOTE

Following procedures are performed with gearbox rear housing out of stand on a bench.

- a. Position gearbox housing baffle(13, figure 1) gearbox sump cover assembly(11), and protective screen(12) in rectangular pad inside gearbox rear housing. Install key washers(10) with prebent tabs in locking holes. Install screws(9). Ensure prebent tabs of key washers are engaged in locking holes. Bend tabs of key washers.
- b. Install workbolt at location C and secure baffle(13).
- c. Torque screws(9) 24 to 36 pound-inches. Bend tabs of key washers(10).
- d. Remove workbolt at location C.
- e. Insert gearbox scavenge tubes(7 and 8) into openings in gearbox sump cover assembly(11).

- f. Install gearbox bevel gearshaft assembly as follows:

- (1) Place packing(4) onto gearbox sealing sleeve and bevel gearshaft assembly(3).
- (2) Verify that serial numbers on outer race (previously assembled on upper gearbox cover(5) and inner race and rollers on gear) are identical.
- (3) Install packing(6) onto upper gearbox cover(5). Install upper gearbox cover(5) in gearbox rear housing, aligning gearbox scavenge tubes(7 and 8) and boltholes in cover with holes in gearbox housing.



Do not force seating of assembly as damage will result to scavenge tubes.

- (4) Install gearbox sealing sleeve and bevel gearshaft assembly(3) into upper gearbox cover(5), using four PWA 50876 alignment pins and aligning offset hole.



(5) Remove alignment pins.

g. Deleted.

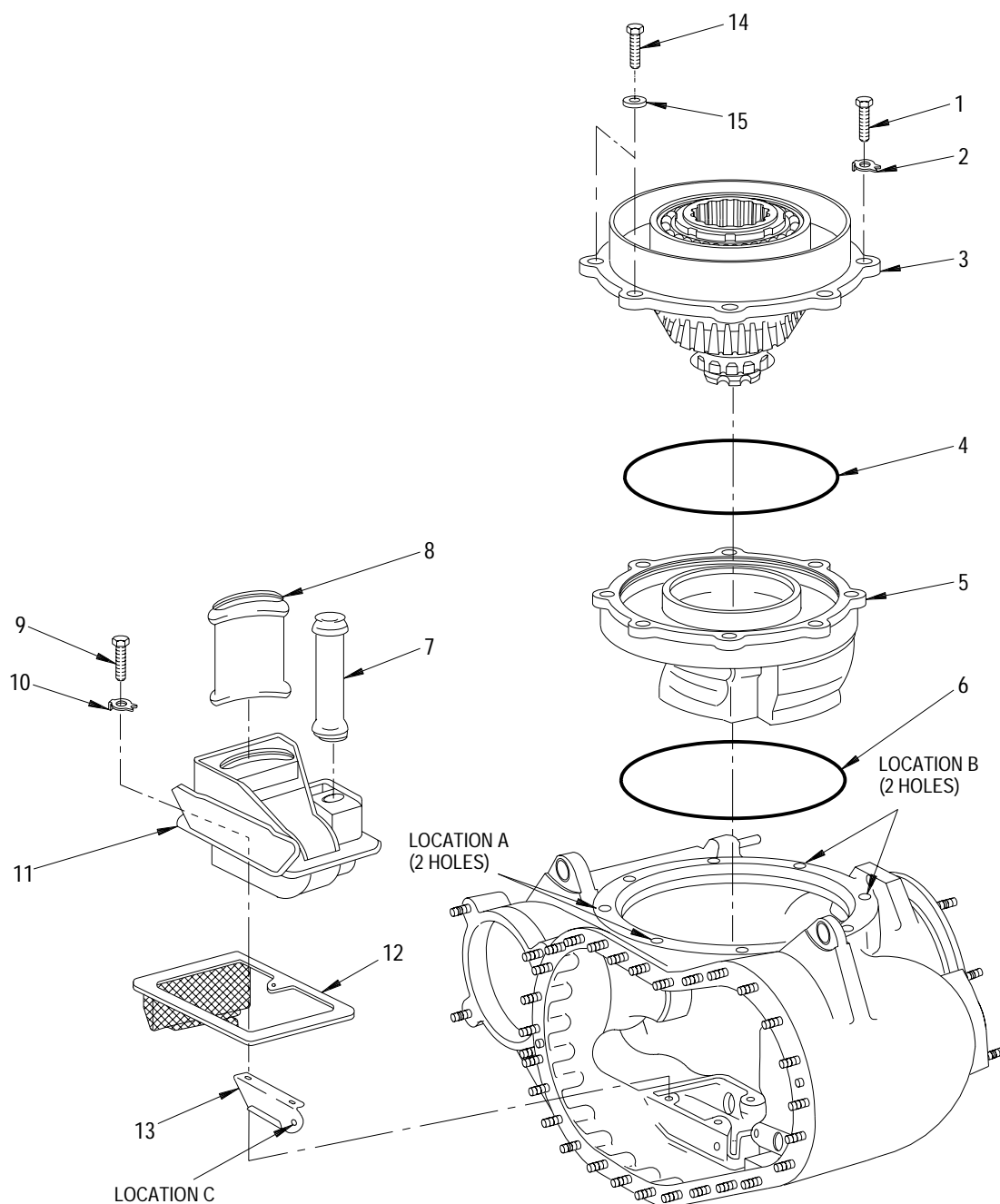
h. Secure gearbox bevel gearshaft assembly as follows:

- (1) Apply Hylomar PL-32 sealing compound (PWA 36000-3 or PWA 36000-2) to bolts(14) that thread through holes at location A, and bolts(1) that thread through holes at location B. (See figure 1.) Wait 10 minutes; then install bolts(14) and washers(15) at location A and bolts(1) with key washers(2) in every other hole leaving offset hole free.

#### NOTE

Remaining bolts(1) will be installed after gearbox pressure check.

- (2) Tighten bolts 180 degrees apart to final torque of 65 to 85 pound-inches for bolts(14) at location A, and 75 to 85 pound-inches for bolts(1). Do not lockwire or secure key washers until pressure check has been accomplished.



108167 (48X2)

**Figure 1. Gearbox Bevel Gearshaft Assembly, Gearbox Scavenge Tubes, and Gearbox Sump Cover Assembly - Installation**

## Legend for figure 1

Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Bolt	See text.	75 to 85	-
2.	PN 171752 Key washer	-	-	-
3.	Gearbox sealing sleeve and bevel gearshaft assembly	-	-	-
4.	PN ST1000-163 Packing	MIL-L-7808	-	-
5.	Upper gearbox cover	-	-	-
6.	PN ST1000-164 Packing	MIL-L-7808	-	-
7.	Gearbox scavenge tube	-	-	-
8.	Gearbox scavenge tube	-	-	-
9.	Screw	MIL-L-7808	24 to 36	-
10.	PN 4014749 Key washer	-	-	-
11.	Gearbox sump cover assembly	-	-	-
12.	Protective screen	-	-	-
13.	Gearbox housing baffle	-	-	-
14.	PN MS9686-13 Bolt	See text.	65 to 85	MS9226-04
15.	PN MS9549-10 Washer	-	-	-
16.	Deleted			

**4. GEARBOX DRIVE SPUR BEVEL GEARSHAFT  
AND BEARING ASSEMBLY - INSTALLATION**

(See Figures 2 and 3.)

- a. Position gearbox housing onto PWA 57412 stand by fitting gearbox housing lugs into clevises of PWA 50473 adapter on stand.
- b. Lock gearbox housing in place using ball lock pins.
- c. Position gearbox housing with large cavity up.
- d. Deleted.
- e. Deleted.
- f. Verify all bearing details of duplex ball bearing have same serial number.
- g. Install bevel spur gearshaft into gearbox housing as follows:

**NOTE**

- Bearing inner race (front half) does not have puller groove.
  - X-mark on inner race (rear half) shall be facing tool and visible when installed in pusher.
- (1) Attach PWA 57050 puller to inner race half(16, figure 2). Retract screw adjustment so it will not contact shaft when rear half(16) is installed.
  - (2) Heat bearing inner race front half(2) and rear half(16) installed in PWA 57050. Heat to minimum 250° to 300°F (121° to 149°C) maximum.

- (3) Position end of gearshaft that has larger diameter over stub on PWA 50648 base
- (4) Place front half inner race on gearshaft, small OD up, and seat using PWA 57047 drift and standard arbor press.
- (5) Using Colorbrite Silver No. 2101 metal marking crayon, mark end of gearshaft in line with x-mark on installed front inner race.



Use extreme care when installing gearshaft so gear teeth and previously installed inner race will not be damaged.

- (6) Install gearshaft assembly(1) through center boss while aligning small spur gear with oil pump idler gear and large gear on gearshaft with tower shaft gear.
- (7) Retract center post and install PWA 53825 support on studs of gearbox housing assembly and secure with four detail nuts. Secure nuts fingertight and loosen one full turn. Adjust plug detail to contact end of gearshaft assembly(1).

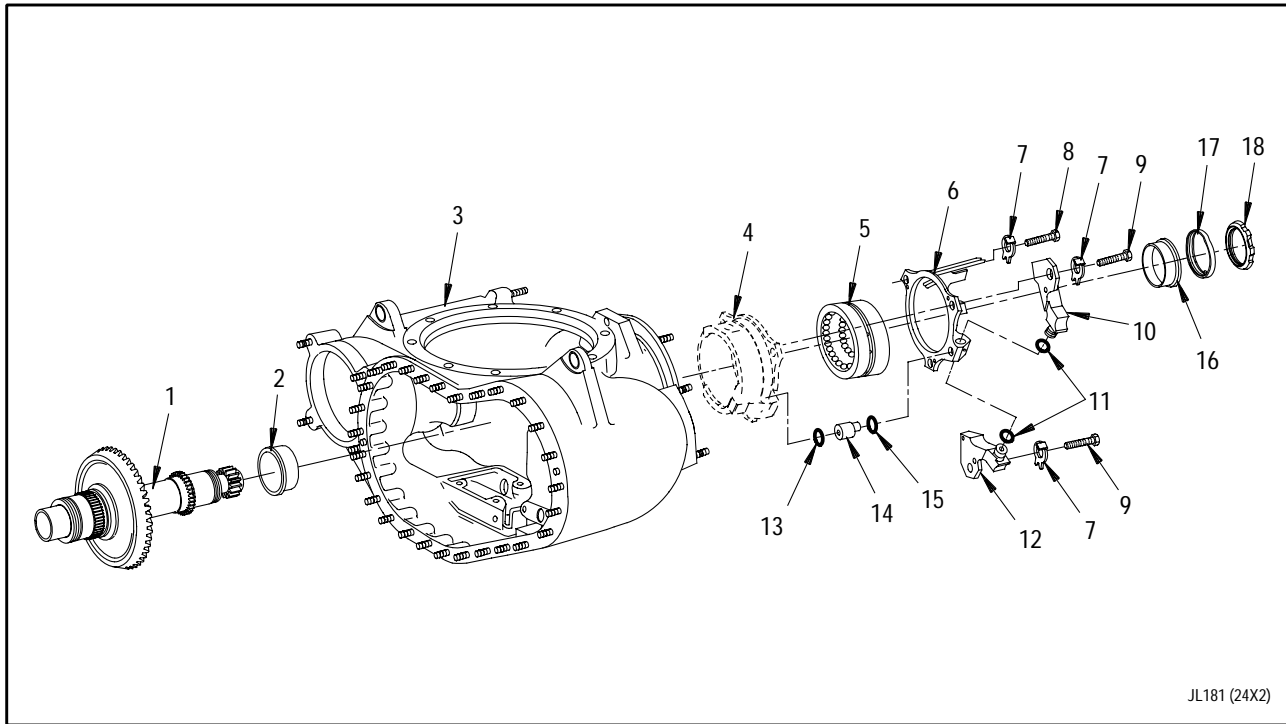


Do not allow oil pump idler gear to come in contact with forward inner race of gearbox drive spur bevel gearshaft assembly.

#### NOTE

Gearbox drive spur bevel gearshaft gear will be lower than main oil pump idler gear.

- (8) Rotate gearbox housing assembly so large cavity is facing down. Adjust plug detail of PWA 53825 support to lower gearbox drive spur bevel gearshaft, so 1/2 of main oil pump idler gear tooth engages gearbox drive spur bevel gearshaft spur gear.
- (9) Align gearbox drive spur bevel gearshaft using PWA 57368 or FLD 131316 crimper as follows:
  - (a) Install PWA 57368 cup detail alignment tool into retaining plate(4, figure 2). Install PWA 57368 shaft detail through cup detail and gearbox drive spur bevel gearshaft. Secure shaft detail fingertight.
  - (b) Secure four nuts of PWA 53825 support fingertight.
  - (c) Remove alignment tool.



Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Gearbox drive spur bevel gearshaft assembly	-	-	-
2.	Bearing inner race (front half)	-	-	-
3.	Gearbox housing assembly	-	-	-
4.	Gearbox bearing retaining plate (previously installed)	-	-	-
5.	Duplex bearing outer race and ball	-	-	-
6.	Gearbox bearing retaining plate	-	-	-
7.	PN 171752 tabwasher	-	-	-
8.	PN MS9519-10 bolt	MIL-L-7808	65 to 85	-
9.	PN MS9519-13 bolt	MIL-L-7808	65 to 85	-
10.	Gear pump oil nozzle	-	-	-
11.	PN AS3209-008 packing	MIL-L-7808	-	-
12.	Gear pump oil nozzle	-	-	-
13.	PN ST1050-011 packing	MIL-L-7808	-	-
14.	Packing transfer tube	-	-	-
15.	PN ST1050-009 packing	MIL-L-7808	-	-
16.	Bearing inner race (rear half)	-	-	-
17.	PN 4062030 key washer	-	-	-
18.	Nut	-	425 to 475	-

**Figure 2. Gearbox Drive Spur Bevel Gearshaft Assembly and Duplex Ball Bearing Package - Installation (Reduction Gearbox Configuration)**

h. Install duplex bearing as follows in accordance with either Method I, Method II or Method III:

(1) Method I:

- (a) Install three each PWA 50611 guide pins into retaining plate.
- (b) Locally heat retaining plate(4, figure 2) to 185°F (85°C) minimum.
- (c) Carefully apply sufficient amount of assembly fluid (No. 1, PWA 36500 or equivalent) to both rows of balls, to retain balls back into raceway pocket.
- (d) Lightly lubricate OD of bearing outer race, using MIL-L-7808 or equivalent.
- (e) Install outer race, cage, and balls(5) over shaft and into heated retaining plate. Seat, using light pressure. Z-mark of outer race must be face up.
- (f) Cool previously heated parts to room temperature.

(2) Method II:

- (a) Install three each PWA 50611 guide pins into retaining plate(4, figure 2).

- (b) Carefully apply sufficient amount of assembly fluid (No. 1, PWA 36500 or equivalent) to both rows of balls, to retain balls back into raceway.

- (c) Lightly lubricate OD of bearing outer race, using MIL-L-7808 or equivalent.



Do not push on cage or balls. This may cause damage to bearings.

- (d) Position outer race, cage, and balls onto retaining plate. Z-mark of outer race must be face up.
- (e) Ensure balls are back into raceway pocket. If not, reapply assembly fluid (No. 1, PWA 36500 or equivalent).
- (f) Retract adjustment shaft of SA-ALC pusher tool, 8750312, and install on fuel pump mount pad. Secure four nuts fingertight.
- (g) Tighten screw detail of pusher tool to engage three guide pins. Seat outer race, cage, and balls.
- (h) Remove tool from fuel pump mount pad.





## (3) Method III:

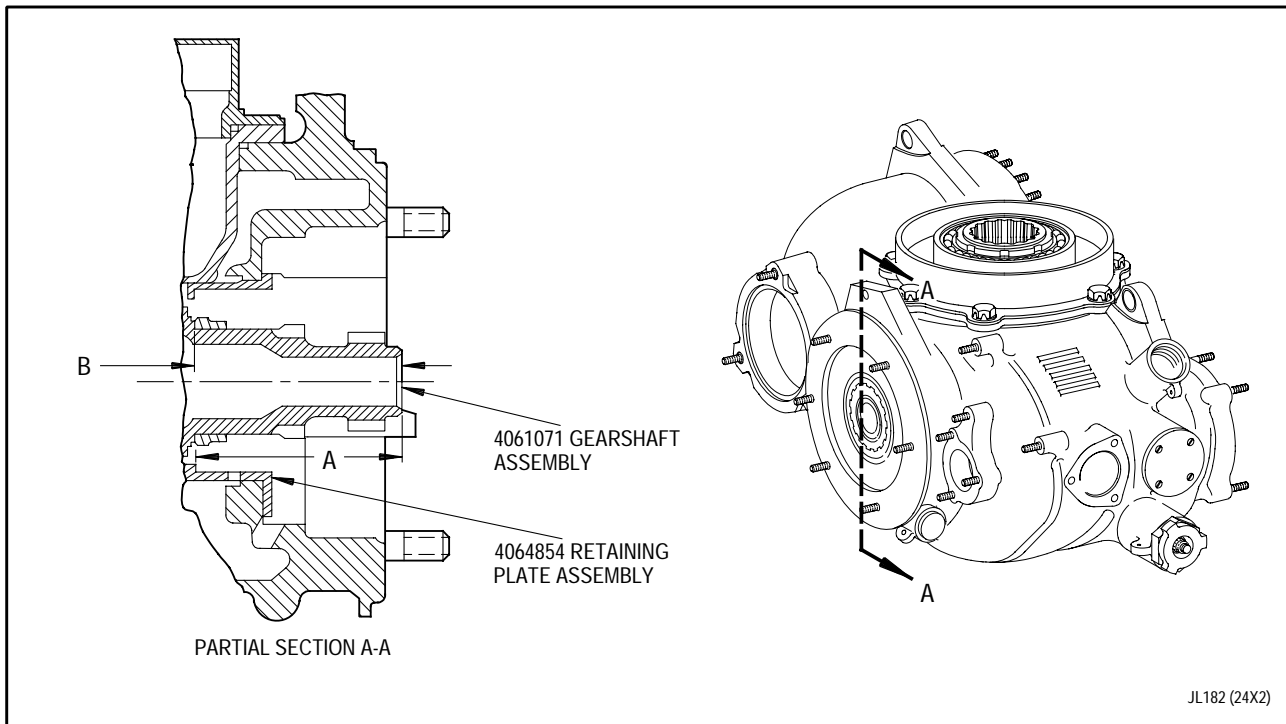
- (a) Install three each PWA 50611 guide pins into retaining plate (4, figure 2).
- (b) Carefully apply sufficient amount of assembly fluid (No. 1, PWA 36500 or equivalent) to both rows of balls, to retain balls back into raceway.
- (c) Lightly lubricate OD of bearing outer race, using MIL-L-7808 or equivalent.



Do not push on cage or balls.  
This may cause damage to  
bearings.

- (d) Position outer race, cage, and balls onto retaining plate. Z-mark of outer race must be face up.

- (e) Ensure balls are back into raceway pocket. If not, reapply assembly fluid (No. 1, PWA 36500 or equivalent).
- (f) Retract adjustment shaft of PWA 57367 and install on fuel pump mount pad. Secure with four nuts fingertight.
- (g) Tighten screw detail of pusher tool to engage inner pushing detail ears with three guide pins. Seat outer race, cage, and balls.
- (h) Remove tool from fuel pump mount pad.



**Figure 3. Adjustment of PWA 53825 Support**

(4) Complete duplex bearing installation as follows:

- (a) Raise PTO shaft by hand until front inner race(2) seats against bearing(5). Adjust plug detail of PWA 53825 support, handtight, to secure PTO shaft.
- (b) Rotate gearbox housing 90 degrees so that PTO shaft is in horizontal position.
- (c) Lightly lubricate OD of PTO gearshaft at rear inner race location using MIL-L-7808 or equivalent.



PWA 57050 puller is used only to hold inner race rear half(16). Inner race half(16) is seated using only hand pressure on tool.

**NOTE**

Verify location of mark on PTO shaft corresponding to front inner race x-mark.

- (d) Install heated inner race half(16) (installed on PWA 57050) on gearshaft aligning x-marks on race with x-mark on previously installed inner race front half. Ensure that x-marks are aligned within plus or minus five degrees. Puller groove and z-mark shall be on external side of race.

- (e) Allow PWA 57050 puller to cool. Remove tool.
- (f) Secure bevel spur gearshaft(1) as follows:
  - 1 Apply light coat of MIL-L-7808 or equivalent, to nut side of key washer. Install key washer(17) and nut(18) fingertight.
  - 2 Remove PWA 53825 support and install PWA 57049 torque adapter to secure gearshaft assembly(1) while inner race retaining nut(18) is being tightened.
  - 3 Remove crayon mark from end of shaft.
  - 4 Rotate gearbox housing so large cavity is facing downward.
  - 5 Mark key washer(17) and adjacent surface using metal marking crayon so any rotation of key washer can be detected when torquing nut.
  - 6 Torque nut(18) as follows:
    - a Install PWA 57048 wrench over gearshaft assembly(1) and engage retaining nut(18).
    - b Torque nut(18) 425 to 475 pound-inches.
  - 7 Check index marks to ensure key washer(17) has not rotated and sheared tabs. Remove index marks.
  - 8 Using PWA 56805 adapter, crimp key washer(17) at four locations 90 degrees apart.
  - 9 Remove PWA 57049 torque adapter.
  - 10 Flow check all oil passages. Refer to T.O. 2J-F100-53-1 WP 026 00.
  - 11 Position new packing(13) into recess in plate(4).
  - 12 Install new packing(15) around small OD of tube(14).
  - 13 With small OD of tube(14) facing up, install tube into plate(4).
  - 14 Flow check oil nozzles(10 and 12). Refer to T.O. 2J-F100-53-1, WP 026 00.
  - 15 Install new packing(11) on oil nozzles(10 and 12).
  - 16 Install oil nozzles(10 and 12) into plate(6) as shown.
  - 17 Align dowel pin hole in plate(6) with dowel pin in plate(4). Position plate down over aligning pins and bearing.
  - 18 Replace two alignment pins with two tabwashers(7) and bolts(9).

19 Replace remaining alignment pin with tabwasher(7) and bolt(8).

20 Torque bolts. Inspect prebent tabs to ensure they are still installed in holes. Bend remaining tabs to secure.

## 5. DEAERATOR IMPELLER SHAFT AND DEAERATOR IMPELLER ASSEMBLY - INSTALLATION.

(See Figure 4.)

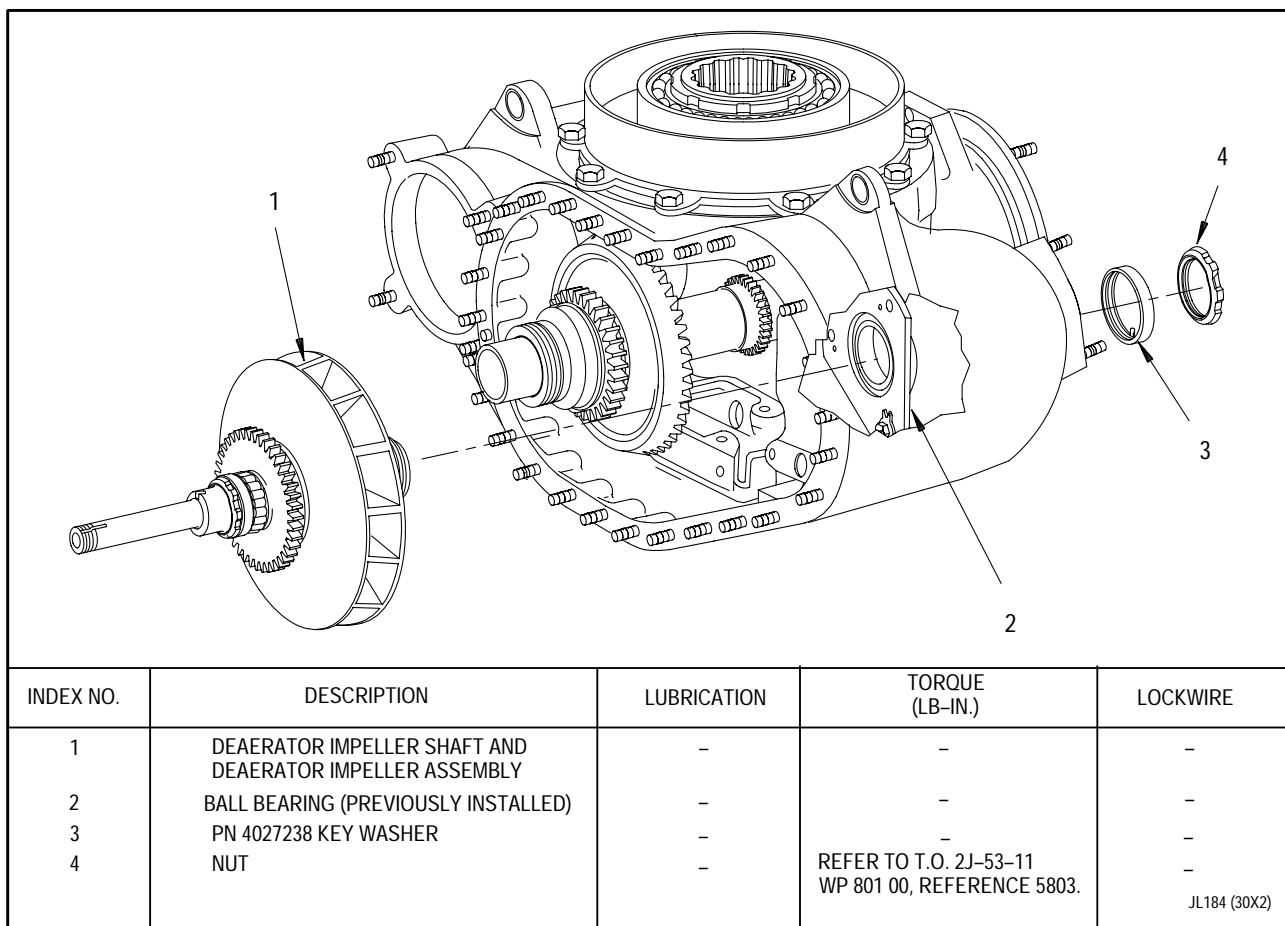
a. Pull deaerator impeller shaft and deaerator impeller assembly(1) into housing with PWA 55823 puller as follows:

- (1) Position impeller assembly(1) onto previously installed ball bearing(2).
- (2) Install PWA 55823 puller into dome side of gearbox housing and slip detail legs through bearing and into deaerator impeller shaft. Expand detail legs into two slots in shaft. Position puller housing against bearing inner race.
- (3) Using standard wrench on wrench flats of stud, turn stud until deaerator impeller assembly(1) is pulled into ball bearing(2). Remove PWA 55823 puller.
- (4) Install key washer(3) so tangs of key washer engage slots in shaft. Install PWA 55823 puller. Refer to step a.(2). Torque puller 275 to

300 pound-inches. Remove puller.

b. Install nut(4) as follows:

- (1) Engage spring clip details of PWA 57108 wrench in two slots of nut(4). Using PWA 57108 wrench, install nut(4) onto shaft, handtight.
- (2) Mark key washer(3) and adjacent surface using Colorbrite No. 2101 silver pencil or equivalent, so any rotation of key washer can be detected when torquing nut.
- (3) Install PWA 56685 holder over generator end of shaft so lugs of holder engage slots on each side of shaft. Secure holder to gearbox housing studs, using gearbox housing hardware. Torque nuts 180 to 230 pound-inches.
- (4) Install PWA 55824 wrench on nut(4).
- (5) Install torque wrench on PWA 55824 wrench. Torque nut(4) 475 to 525 pound-inches.
- (6) Check index marks to ensure key washer(3) has not rotated and sheared tabs. Wipe key washer and adjacent surface to remove index marks.
- (7) Position PWA 57378 crimper on key washer(3) with detail-4 located with cutout in nut. Tap with mallet to crimp key washer.



**Figure 4. Deaerator Impeller Shaft and Deaerator Impeller Assembly - Installation**



**SUBORDINATE WORK PACKAGE****TECHNICAL PROCEDURES**

**GEARBOX (REAR) HOUSING  
(INCORPORATING PTO DUPLEX BEARING  
WITH ONE PIECE INNER RACE) -**

**FINAL ASSEMBLY**

**EFFECTIVITY: ENGINE MODEL F100-PW-229**

**LIST OF EFFECTIVE SWP PAGES**

Total Number of Pages in this SWP is 26

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 . . . . .	21	6 . . . . .	21	11 - 13 . . . . .	19
2 - 2A . . . . .	19	6A Deleted . . . . .	19	14 - 15 . . . . .	21
2B Blank Added . . . . .	16	6B Blank Deleted . . . . .	19	16 . . . . .	19
3 . . . . .	21	7 - 8 . . . . .	11	17 - 23 . . . . .	21
4 . . . . .	16	9 - 10 . . . . .	9	24 Blank Added . . . . .	19
5 . . . . .	19				

## REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
General Procedures Oil Nozzle Assembly, Air or Visual Flow Check - - - - -	WP 026 00
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Gearbox (Rear) Housing - Partial Assembly - - - - -	WP 702 00
Gearbox Module - Table of Limits and Clearance Charts - -	WP 801 00

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
BAG, PLASTIC, OR EQUIVALENT	-
COMPOUND, SEALING (PWA 36000-3 OR PWA 36000-2)	HYLOMAR PL-32
CRAYON, SILVER MARKING METAL	COLORBRITE SILVER NO. 2101
DRY ICE (SOLID CO <sub>2</sub> )	-
LUBRICANT, SEALING RING (PWA 36500)	ULTRACHEM ASSEMBLY FLUID NO. 1
OIL, LUBRICATING	MIL-L-7808

## EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
KEY WASHER	4014749	3
KEY WASHER	4062030	1
PACKING, PREFORMED	AS3209-008	2
PACKING, PREFORMED	ST1000-163	1
PACKING, PREFORMED	ST1000-164	1
PACKING, PREFORMED	ST1050-009	1
PACKING, PREFORMED	ST1050-011	1
TAB WASHER	171752	12



## APPLICABLE SUPPORT EQUIPMENT

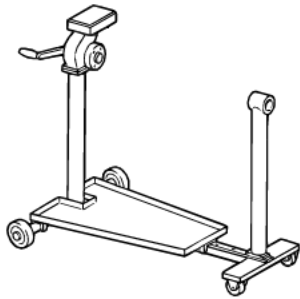
Paragraph	Function - Tool Nomenclature	Tool Number
2	GEARBOX SPUR (OIL PUMP DRIVE IDLER) GEARSHAFT AND SCAVENGE PUMP - BACKLASH MEASUREMENT IN GEARBOX (REAR) HOUSING	
	HOLDER, GEARBOX SCAVENGE PUMP TO GEARBOX - - - - -	PWA 50482
	HOLDER, OIL PUMP DRIVEGEAR - - - - -	PWA 50528
	ADAPTER, OIL PUMP IDLER GEAR - - - - -	PWA 50529
	STAND, MAIN GEARBOX - - - - -	PWA 57412
		OR
	STAND, MAIN GEARBOX - - - - -	PWA 27606
3	GEARBOX BEVEL GEARSHAFT ASSEMBLY, GEARBOX SCAVENGE TUBES, AND GEARBOX SUMP COVER ASSEMBLY - INSTALLATION	
	PINS, ALIGNING - - - - -	PWA 50876
5	DEAERATOR IMPELLER SHAFT AND DEAERATOR IMPELLER ASSEMBLY - INSTALLATION	
	PULLER, DEAERATOR IMPELLER SHAFT SUBASSEMBLY INTO BALL BEARING - - - - -	PWA 55823
	WRENCH, DEAERATOR IMPELLER SHAFT BALL BEARINGS RETAINING NUT - - - - -	PWA 57108
	HOLDER, IGNITION ALTERNATOR DRIVE SHAFT - - - - -	PWA 56685
	WRENCH, DEAERATOR IMPELLER SHAFT BALL BEARINGS RETAINING NUT - - - - -	PWA 55824
	CRIMPER, DEAERATOR IMPELLER SHAFT BALL BEARING INNER RACE KEY WASHER - - - - -	PWA 57378



## APPLICABLE SUPPORT EQUIPMENT (continued)

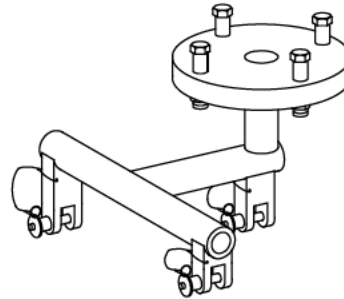
Paragraph	Function - Tool Nomenclature	Tool Number
6	GEARBOX DRIVE SPUR BEVEL GEARSHAFT ASSEMBLY AND BEARING - INSTALLATION	
	STAND, MAIN GEARBOX - - - - -	PWA 57412 OR
	STAND, MAIN GEARBOX - - - - -	PWA 27606
	ADAPTER, HOLDING, MAIN GEARBOX BUILD AND TRANSMISSION STAND - - - - -	PWA 50473
	PIN, ALIGNING, POWER TAKEOFF SHAFT BALL BEARING LINER PACKAGE - - - - -	PWA 50876
	PUSHER/PULLER, PTO DUPLEX BEARING - - - - -	PWA 56556
	PUMP, HYDRAULIC - - - - -	PWA 55380
	PULLER, MAIN GEARBOX DUPLEX BEARING PLATE - - - - -	PWA 57124
	ADAPTER, TORQUE, BEVEL GEARSHAFT DRIVE DUPLEX BEARING NUT - - - - -	PWA 57049
	PULLER, BEVEL GEARSHAFT DRIVE BEARING INNER RACE UPPER - - - - -	PWA 57050
	WRENCH, TORQUE, BEVEL GEARSHAFT DRIVE DUPLEX BEARING NUT - - - - -	PWA 57048
	PIN, ALIGNING - - - - -	PWA 50611

**ILLUSTRATED SUPPORT EQUIPMENT**



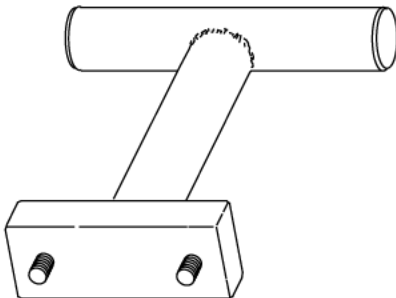
PWA 27606 -C

**Figure T1. PWA 27606 STAND**



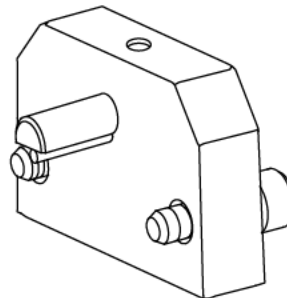
PWA 50473 -C

**Figure T2. PWA 50473 ADAPTER**



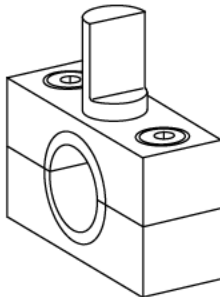
PWA 50482 -C

**Figure T3. PWA 50482 HOLDER**



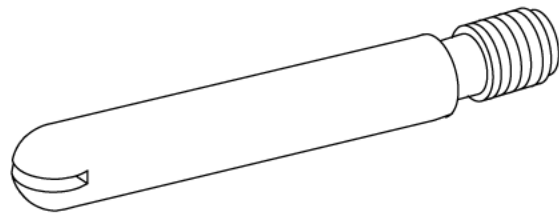
PWA 50528A -C

**Figure T4. PWA 50528 HOLDER**



PWA 50529 -C

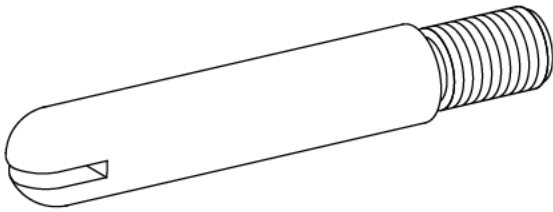
**Figure T5. PWA 50529 ADAPTER**



PWA 50611 -C

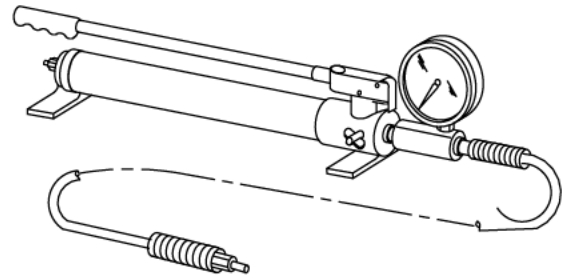
**Figure T6. PWA 50611 PINS**

ILLUSTRATED SUPPORT EQUIPMENT (continued)



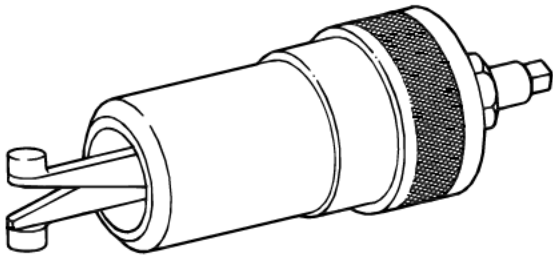
PWA 50876 -C

Figure T7. PWA 50876 PINS



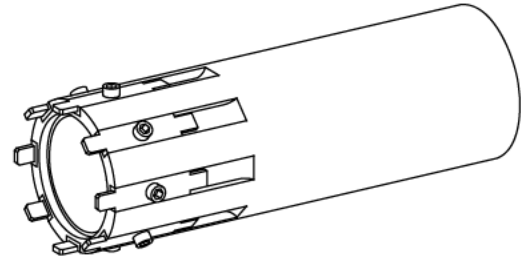
PWA 55380 -C

Figure T8. PWA 55380 PUMP



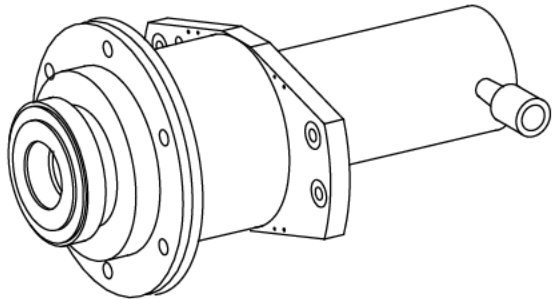
PWA 55823 -C

Figure T9. PWA 55823 PULLER



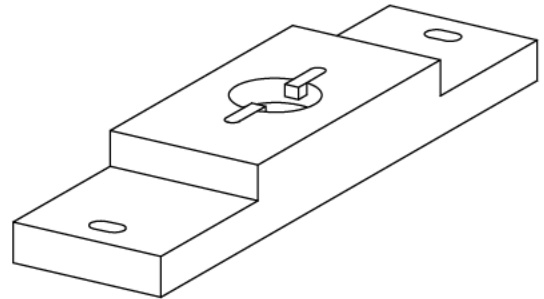
PWA 55824 -C

Figure T10. PWA 55824 WRENCH



PWA 56556 -C

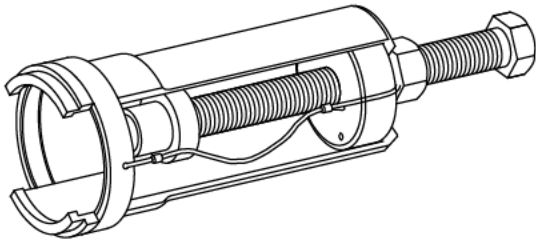
Figure T11. PWA 56556 PUSHER/PULLER



PWA 56685 -C

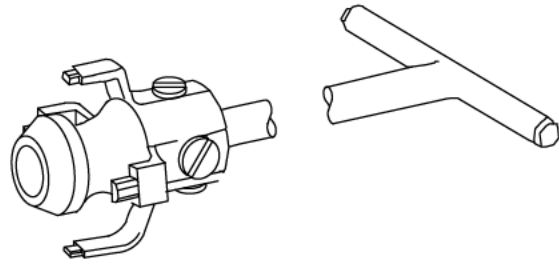
Figure T12. PWA 56685 HOLDER

ILLUSTRATED SUPPORT EQUIPMENT (continued)



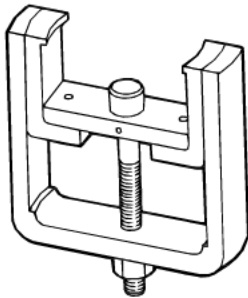
PWA 57050 -C

Figure T13. PWA 57050 PULLER



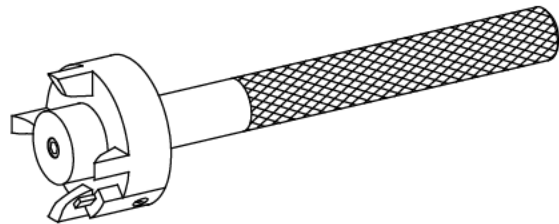
PWA 57108 -C

Figure T14. PWA 57108 WRENCH



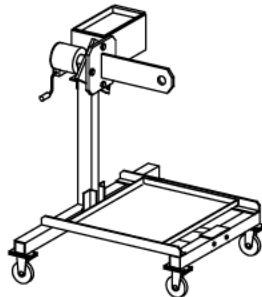
PWA 57124 -C

Figure T15. PWA 57124 PULLER



PWA 57378 -C

Figure T16. PWA 57378 CRIMPER



PWA 57412 -C

Figure T17. PWA 57412 STAND

**1. INTRODUCTION.****NOTE**

Gearbox rear housings incorporating PTO gearshaft duplex bearing with two piece split inner race shall be assembled per WP 703 00.

- a. This subordinate work package contains instructions for installation of gearshaft subassemblies, bearings, and associated parts into gearbox (rear) housing to complete final assembly of housing incorporating PTO gearshaft duplex bearing with one piece inner race. Partial assembly and air flow test of housing is completed in WP 702 00.

**2. GEARBOX SPUR (OIL PUMP DRIVE IDLER) GEARSHAFT AND SCAVENGE PUMP - BACKLASH MEASUREMENT IN GEARBOX (REAR) HOUSING.**

- a. Install gearbox housing into PWA 57412 build stand.
- b. Install gearbox No. 2 and 3 bearing scavenge pump assembly as follows:
  - (1) Using detail bolts, fasten PWA 50482 holder to scavenge pump.
  - (2) Partially insert pump into cavity of gearbox housing.
  - (3) When gear clears housing wall, twist pump 1/4 turn clockwise.
  - (4) Locate scavenge pump on pin in gearbox housing and push to seat.

- c. Make backlash measurement as follows:

- (1) Position PWA 50528 holder so holder detail engages main oil pump drive splined socket of scavenge pump. Secure plate detail to scavenge pump housing with detail screws.



PWA 50529 adapter shall be fastened firmly to gearshaft so it does not slip and cause damage to gearshaft or result in inaccurate dial indicator readings during backlash measurement.

- (2) Install PWA 50529 adapter on gearbox spur gearshaft between two gears on gearshaft with detail block having L-shaped piece facing into center of gear housing and scribe line on L-shaped piece facing large circular opening.

**NOTE**

Dial indicator with parallel bars to clear housing studs is recommended.

- (3) Using dial indicator setup, position indicator point on scribe line of tool.
- (4) Rock gear back and forth and record amount of backlash. Refer to WP 801 00, Reference 5707.
- (5) Remove PWA 50528 holder and PWA 50529 adapter.

d. Remove scavenge pump as follows:

- (1) Pull scavenge pump forward to clear mounting pin in gearbox housing.
- (2) Twist scavenge pump approximately 1/4 turn counterclockwise and pull scavenge pump from housing.

e. Remove gearbox rear housing from PWA 57412 build stand.

### **3. GEARBOX BEVEL GEARSHAFT ASSEMBLY, GEARBOX SCAVENGE TUBES, AND GEARBOX SUMP COVER ASSEMBLY - INSTALLATION.**

(See Figure 1.)

#### **NOTE**

Following procedures are performed with gearbox rear housing out of stand on a bench.

- a. Position gearbox housing baffle(13, figure 1), gearbox sump cover assembly(11), and protective screen(12) in rectangular pad inside gearbox rear housing.
- b. Install key washers(10) with prebent tabs in locking holes. Install screws(9). Ensure prebent tabs of key washers are engaged in locking holes.
- c. Install workbolt at location C and secure baffle(13).
- d. Torque screws(9) 24 to 36 pound-inches. Bend tabs of key washers(10).
- e. Remove workbolt at location C.
- f. Insert gearbox scavenge tubes(7 and 8) into openings in gearbox sump cover assembly(11).
- g. Install gearbox bevel gearshaft assembly as follows:
  - (1) Place packing(4) onto gearbox sealing sleeve and bevel gearshaft assembly(3).
  - (2) Verify that serial numbers on outer race (previously assembled on upper gearbox cover(5)) and inner race and rollers (previously assembled on gearbox sealing sleeve and bevel gearshaft assembly(3)) are identical.

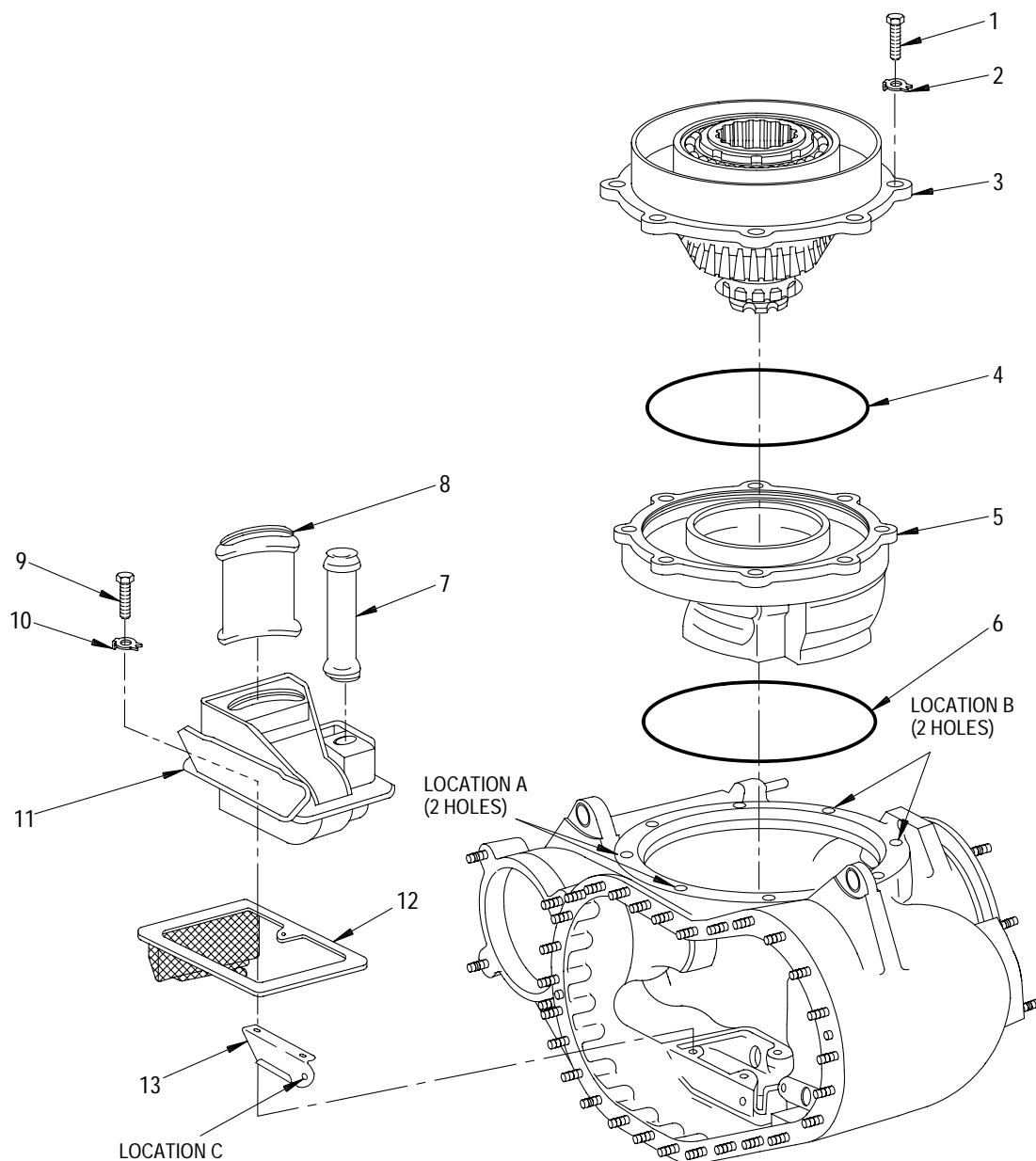


Do not force seating of assembly to prevent damage to scavenge tubes.

- (3) Install packing(6) onto upper gearbox cover(5). Install upper gearbox cover(5) in gearbox rear housing aligning gearbox scavenge tubes(7 and 8) and boltholes in cover with holes in gearbox housing.



- (4) Using four PWA 50876 alignment pins, install gearbox sealing sleeve and bevel gearshaft assembly(3) into upper gearbox cover(5).
- (5) Apply Hylomar PL-32 sealing compound (PWA 36000-3 or PWA 36000-2) to bolts(1) that thread through holes at locations A and B. (See figure 1.)
- (6) Wait 10 minutes; then install bolts(1) and key washers(2) in every other hole leaving offset hole free. Tighten bolts 180 degrees apart to final torque of 75 to 85 pound-inches. Do not secure key washers. Remaining bolts(1) will be installed after gearbox pressure check.



JL010563 (48X2)

**Figure 1. Gearbox Bevel Gearshaft Assembly, Gearbox Scavenge Tubes, and Gearbox Sump Cover Assembly - Installation**

## Legend for figure 1

Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Bolt	See text.	75 to 85	-
2.	PN 171752 Key washer	-	-	-
3.	Gearbox sealing sleeve and bevel gearshaft assembly	-	-	-
4.	PN ST1000-163 Packing	MIL-L-7808	-	-
5.	Upper gearbox cover	-	-	-
6.	PN ST1000-164 Packing	MIL-L-7808	-	-
7.	Gearbox scavenge tube	-	-	-
8.	Gearbox scavenge tube	-	-	-
9.	Screw	MIL-L-7808	24 to 36	-
10.	PN 4014749 Key washer	-	-	-
11.	Gearbox sump cover assembly	-	-	-
12.	Protective screen	-	-	-
13.	Gearbox housing baffle	-	-	-

**4. Deleted.**

Figures 2 through 4 deleted.

**5. DEAERATOR IMPELLER SHAFT AND  
DEAERATOR IMPELLER ASSEMBLY -  
INSTALLATION.**

(See Figure 5.)

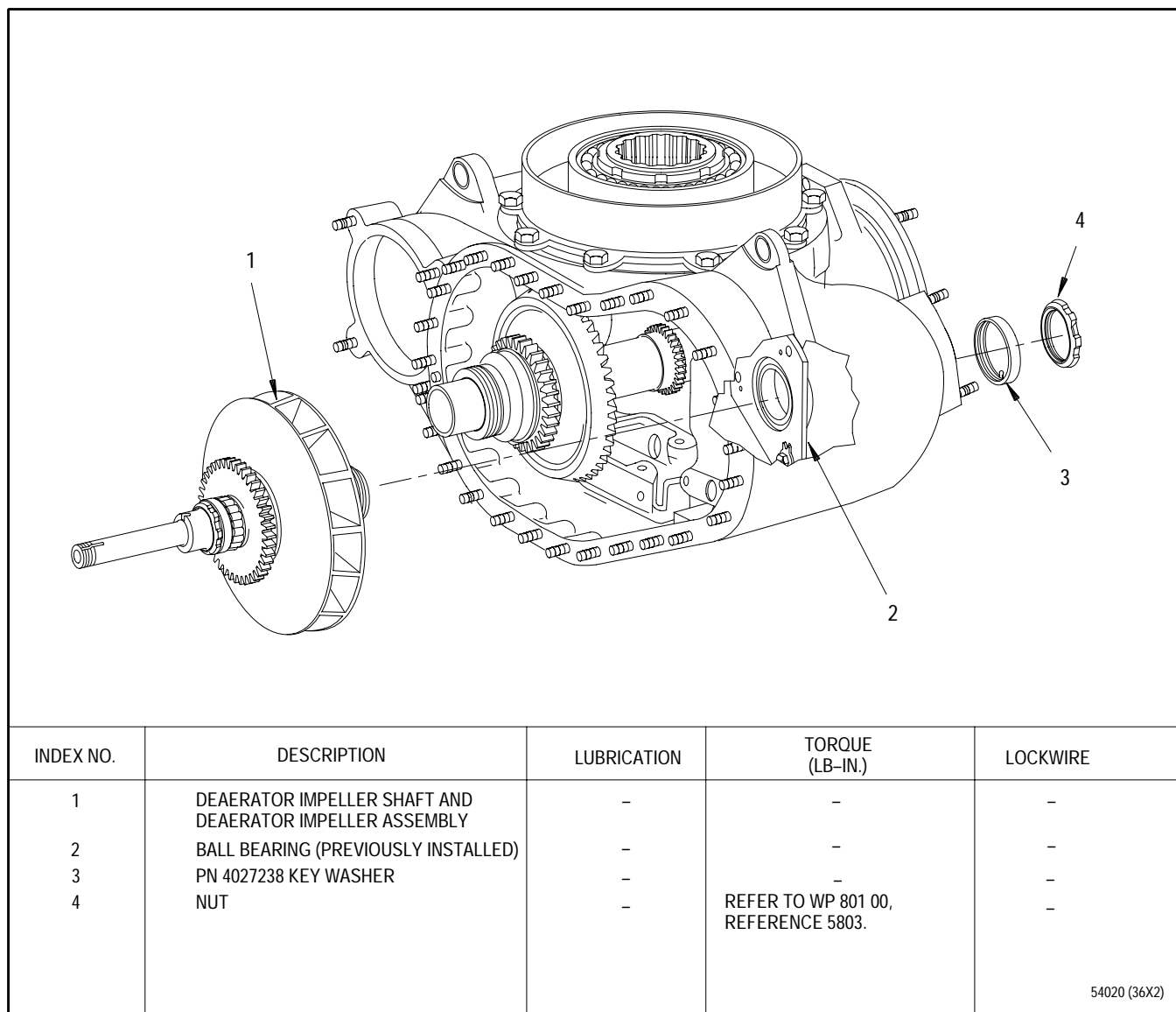
a. Pull deaerator impeller shaft and deaerator impeller assembly(1, figure 5) into housing with PWA 55823 puller as follows:

- (1) Position impeller assembly(1) onto previously installed ball bearing(2).
- (2) Install PWA 55823 puller into dome side of gearbox housing and slip detail legs through bearing and into deaerator impeller shaft. Expand detail legs into two slots in shaft. Position puller housing against bearing inner race.
- (3) Using standard wrench on wrench flats of stud, turn stud until deaerator impeller assembly(1) is pulled into ball bearing(2). Remove PWA 55823 puller.
- (4) Install key washer(3) so tangs of key washer engage slots in shaft. Install PWA 55823 puller. Refer to step a.(2). Torque puller 275 to 300 pound-inches. Remove puller.

b. Install nut(4) as follows:

- (1) Engage spring clip details of PWA 57108 wrench in two slots of nut(4). Using PWA 57108 wrench, install nut(4) onto shaft, handtight.
- (2) Mark key washer(3) and adjacent surface using Colorbrite No. 2101 silver pencil or equivalent, so any rotation of key washer can be detected when torquing nut.

- (3) Install PWA 56685 holder over generator end of shaft so lugs of holder engage slots on each side of shaft. Secure holder to gearbox housing studs, using gearbox housing hardware. Torque nuts 180 to 230 pound-inches.
- (4) Install PWA 55824 wrench on nut(4).
- (5) Install torque wrench on PWA 55824 wrench. Torque nut(4) 475 to 525 pound-inches.
- (6) Check index marks to ensure key washer(3) has not rotated and sheared tabs. Wipe key washer and adjacent surface to remove index marks.
- (7) Position PWA 57378 crimper on key washer(3) with detail-4 located with cutout in nut. Tap with mallet to crimp key washer.



**Figure 5. Deaerator Impeller Shaft and Deaerator Impeller Assembly - Installation**

## 6. GEARBOX DRIVE SPUR BEVEL GEARSHAFT ASSEMBLY AND BEARING - INSTALLATION.

(See Figures 6, 7, 8 and 9.)



Failure to install deaerator impeller shaft and deaerator impeller assembly prior to gearbox drive spur bevel gearshaft assembly and bearing installation into gearbox housing assembly may result in possible handling damage to bearing.

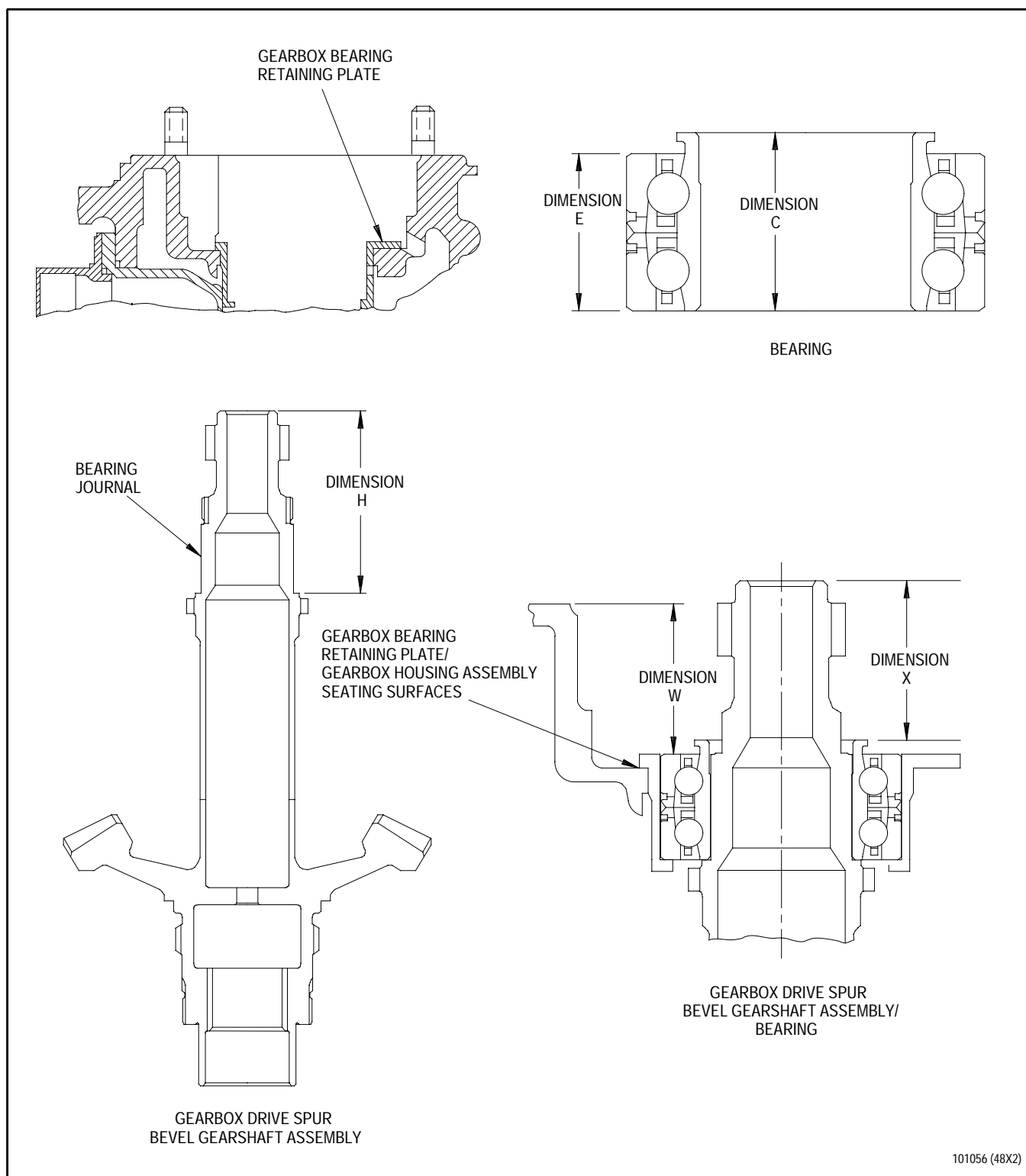
- a. Position gearbox housing assembly onto PWA 57412 stand by fitting housing assembly lugs into clevises of PWA 50473 adapter on stand.
- b. Lock gearbox housing assembly in place using ball lock pins.
- c. Measure following dimensions to ensure proper seating of bearing. See figure 6.
  - (1) Measure axial width of bearing inner race. Record as Dimension C.
  - (2) Measure axial distance from end of gearbox drive spur bevel gearshaft assembly to step on gearshaft where bearing inner race will seat. Record as Dimension H.
- d. Apply lubricating oil to entire gearbox drive spur bevel gearshaft assembly(1, figure 7). Wrap roller bearing with protective plastic bag and leave bearing journal exposed. Cool bearing journal surface to minimum -20°F (-28.9°C) in dry ice (pack for minimum of 15 minutes) or refrigerated cooler (for minimum of one hour at below -40°F (-40°C)).
- e. Position gearbox housing assembly so large cavity is facing down.

- (1) Inspect gearbox bearing retaining plate and bearing to ensure all surfaces are free of any potential debris that can impede seating. Apply lubricating oil to retaining plate inner diameter surface (figure 8) and bearing outer race outer diameter.

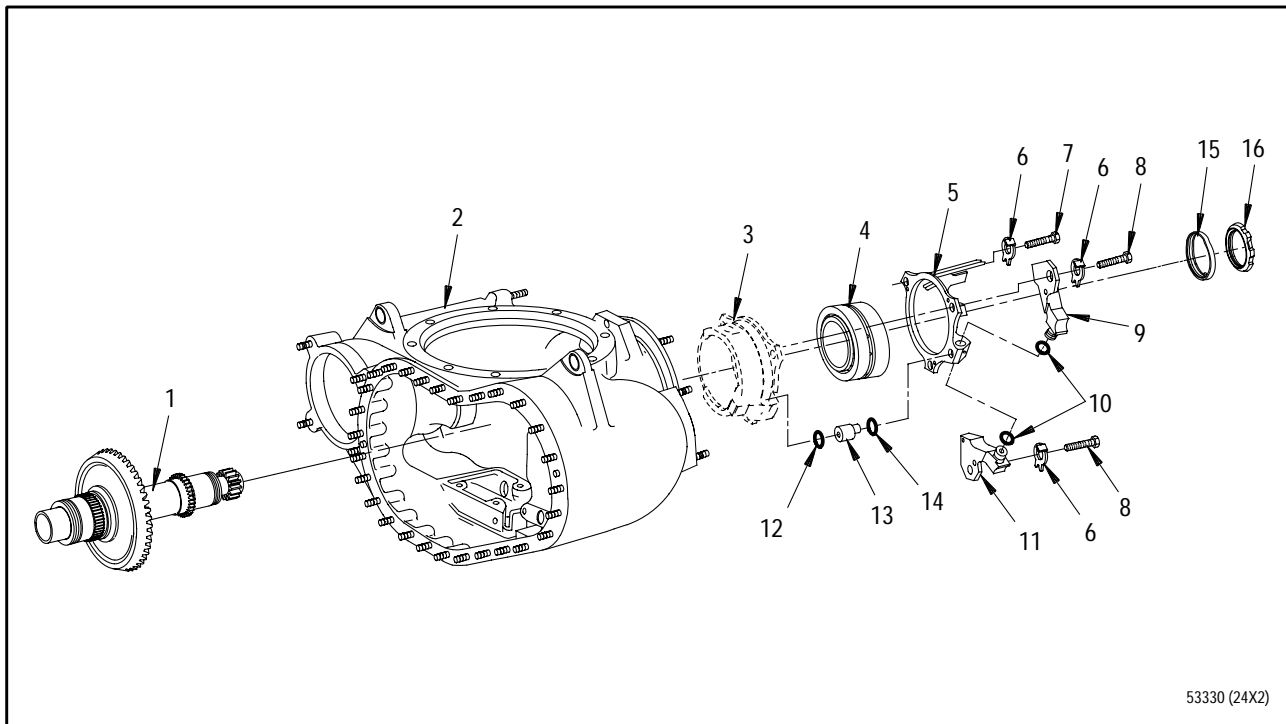


Exceeding finger pressure during installation of bearing may cause bearing damage to occur.

- (2) Position bearing in retaining plate with inner race puller groove facing up and outer race clip gap and outer race oil slots aligned with retaining plate bottom dead center slot. Seat bearing to retaining plate lip by hand using finger pressure on outer race clip to eliminate potential interference of outer race clip with gearbox retaining plate during assembly. See figure 8.
- (3) Use 0.001 inch thick feeler gage to verify bearing outer race is seated to retaining plate lip. Retaining plate may be heated up to 200°F (93.3°C) if necessary to facilitate assembly. If bearing becomes misaligned during hand assembly, remove bearing by hand from retaining plate and retry assembly.
- (4) Lubricate mating ID of gearbox housing assembly(2, figure 7) with lubricating oil, where retaining plate is to be seated later.



**Figure 6. Gearbox Drive Spur Bevel Gearshaft Assembly and Bearing - Bearing Seating Measurements**



Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Gearbox drive spur bevel gearshaft assembly	-	-	-
2.	Gearbox housing assembly	-	-	-
3.	Gearbox bearing retaining plate	-	-	-
4.	Bearing	-	-	-
5.	Gearbox bearing retaining plate	-	-	-
6.	PN 171752 tab washer	-	-	-
7.	PN MS9519-10 bolt	MIL-L-7808	65 to 85	-
8.	PN MS9519-19 bolt	MIL-L-7808	65 to 85	-
9.	Gear pump oil nozzle	-	-	-
10.	PN AS3209-008 packing	MIL-L-7808	-	-
11.	Gear pump oil nozzle	-	-	-
12.	PN ST1050-011 packing	MIL-L-7808	-	-
13.	Packing transfer tube	-	-	-
14.	PN ST1050-009 packing	MIL-L-7808	-	-
15.	PN 4062030 key washer	-	-	-
16.	Nut	-	425 to 475	-

**Figure 7. Gearbox Drive Spur Bevel Gearshaft Assembly and Bearing - Installation**

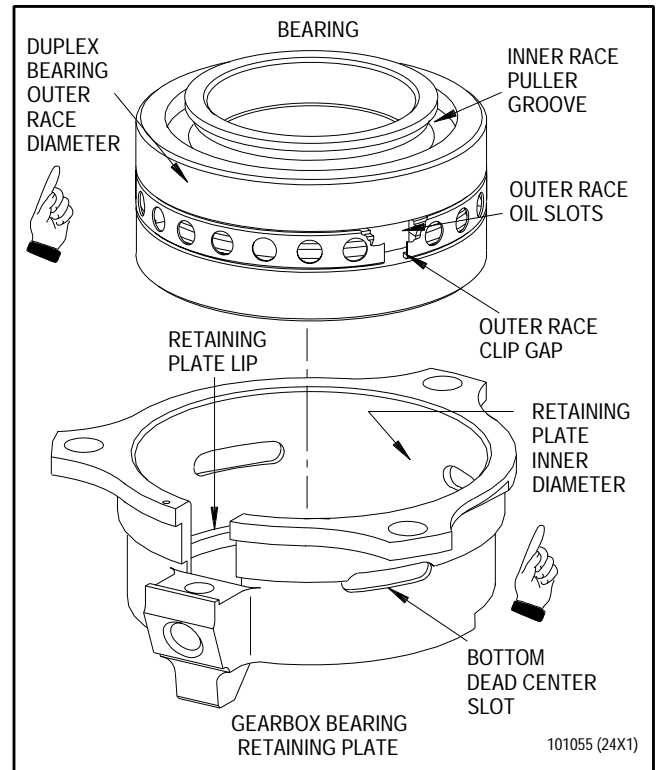


- (5) Install PWA 50876 aligning pins in retaining plate bolt holes of gearbox housing assembly.
- (6) Heat mating ID of gearbox housing assembly to 280°F (137.8°C) to 300°F (148.9°C).



Gearbox bearing retaining plate must be allowed to cool to room temperature with bearing installed to allow seating into ID of gearbox housing assembly or damage to bearing may occur.

- (7) Install room temperature retaining plate on aligning pins with bearing installed so transfer tube port will align with transfer tube when installed, then seat retaining plate to mating ID of gearbox housing assembly by hand as far as possible.
- (8) Remove PWA 50876 aligning pins and install three bolts(7) fingertight. Sequentially tighten each bolt in clockwise pattern to seat retaining plate to gearbox housing assembly. Torque bolts 65 to 85 pound-inches.
- (9) Use 0.001 inch thick feeler gage to verify retaining plate is seated to gearbox housing assembly. See figure 6.
- (10) If retaining plate is properly seated, proceed to step (f). If not properly seated, perform steps (11) through (19).



**Figure 8. Assembly of Bearing and Gearbox Bearing Retaining Plate**

- (11) Remove centering guide pin on PWA 56556 detail-2 adapter.



Failure to install PWA 56556 detail-2 adapter as specified may result in damage to dowel pin.

- (12) Install adapter against bearing, ensuring step on adapter seats with bearing inner and outer races and cutout on adapter aligns with dowel pin on retaining plate to prevent suppression of dowel pin.
- (13) Install PWA 56556 detail-10 ring onto gearbox housing assembly flange.
- (14) Install PWA 56556 detail-3 hydraulic cylinder into detail-19 base.
- (15) Install PWA 56556 detail-19 base onto gearbox housing assembly ensuring round part of base is butted against ring. Secure base using PWA 56556 detail-13 nuts.



Exceeding specified hydraulic pressure limit may cause damage to engine hardware.

- (16) Actuate PWA 55380 hydraulic pump to push gearbox retaining plate and bearing into gearbox housing assembly until gearbox retaining plate flange seats to gearbox housing assembly. Seating is evidenced by rapid rise in hydraulic pressure. Do not exceed 1000 psig pressure.
- (17) Remove PWA 56556 pusher/puller tooling in reverse order of installation.

- (18) Use a 0.001 inch thick feeler gage to verify retaining plate is seated to gearbox housing assembly (figure 6).

- (19) If bearing outer race is properly seated, proceed to step f. If not properly seated, repeat steps (11) through (19). If not properly seated after two attempts, remove gearbox bearing retaining plate with bearing installed, using PWA 57124 puller. Start assembly procedure again at step e(1).

f. Take outer race bearing drop dimension, and support bearing retaining plate and bearing as follows:

- (1) Measure axial distance from gearbox housing to bearing outer race face and record dimension as Dimension W, figure 6 (gearshaft not installed).



Failure to install PWA 56556 detail-2 adapter as specified may result in damage to dowel pin.

- (2) If not already done, remove centering pin on PWA 56556 detail-2 adapter and install adapter against bearing. Ensure step on adapter seats with bearing inner and outer races, and cut-out scallop on adapter aligns with dowel pin on gearbox bearing retaining plate to prevent suppression of dowel pin.
- (3) Install PWA 56556 detail-10 ring onto gearbox housing assembly flange.

- (4) Install PWA 56556 detail-3 hydraulic cylinder into detail-19 base.
- (5) Install PWA 56556 detail-19 base on gearbox housing assembly ensuring round part of base is butted against ring. Secure base using PWA 56556 detail-13 nuts.



Exceeding specified hydraulic pressure limit may cause damage to engine hardware.

- (6) Install PWA 55380 hydraulic pump to PWA 56556 detail-3 hydraulic cylinder. Actuate PWA 55380 pump to hold PWA 56556 detail-2 adapter against bearing and retaining plate. Pump pressure should be 400 to 500 psig to retain bearing in retaining plate during installation of gearbox drive spur bevel gearshaft assembly.
- (7) Carefully position gearbox housing assembly so that large cavity is facing up.

g. Deleted.

h. Install gearbox drive spur bevel gearshaft assembly as follows:

- (1) Verify PWA 56556 detail-2 adapter is centered with bearing inner race ID to prevent any possibility of gearshaft assembly interfering with adapter ID, obstructing installation of gearshaft assembly with bearing.
- (2) Heat bearing inner race to 280°F (137.8°C) to 300°F (148.9°C).

#### NOTE

Oil pump drive spur gear and gearbox drive spur bevel gearshaft assembly should be simultaneously slowly rotated during gearshaft assembly installation to ensure both spur gears mesh and gearshaft seats to bearing inner race.

- (3) Remove gearbox drive spur bevel gearshaft assembly(1, figure 7) from dry ice bath or cooler, wipe frost from shaft and bearing journal and immediately install gearshaft assembly through heated bearing(4) inner race ID. Place finger through breather tube port to access oil pump drive spur gear. Rotate gearshaft assembly and spur gear simultaneously and slowly to ensure both spur gears mesh to allow gearshaft assembly to fully seat with bearing inner race. See figure 9. Remove plastic protective wrap.



Gearbox housing assembly must not be moved while gearshaft assembly is unsupported or damage to bearing may occur.

#### NOTE

- PWA 57049 torque adapter must remain installed during subsequent movement and processing of gearbox housing assembly.
  - Installation of torque adapter is permissible only with gearshaft assembly in vertical position, open end of gearbox housing assembly up.
- (4) Install PWA 57049 torque adapter to secure gearshaft assembly.

- (5) Wait five minutes to allow metal temperatures to stabilize, then position gearbox housing assembly with large cavity down.
- (6) Remove PWA 56556 detail-1 base, detail-10 ring and detail-2 adapter
- (7) Gearshaft assembly is sufficiently engaged if at least four threads on gearshaft protrude past bearing inner race and gearshaft assembly spur gear meshes with oil pump drive spur gear. If sufficiently engaged, go to step (10).
- (8) If gearshaft assembly is not sufficiently engaged or gearshaft assembly spur gear is not meshed with oil pump drive spur gear, remove PWA 57049 torque adapter without moving gearbox. Be sure to hold PWA 57049 while loosening nuts.

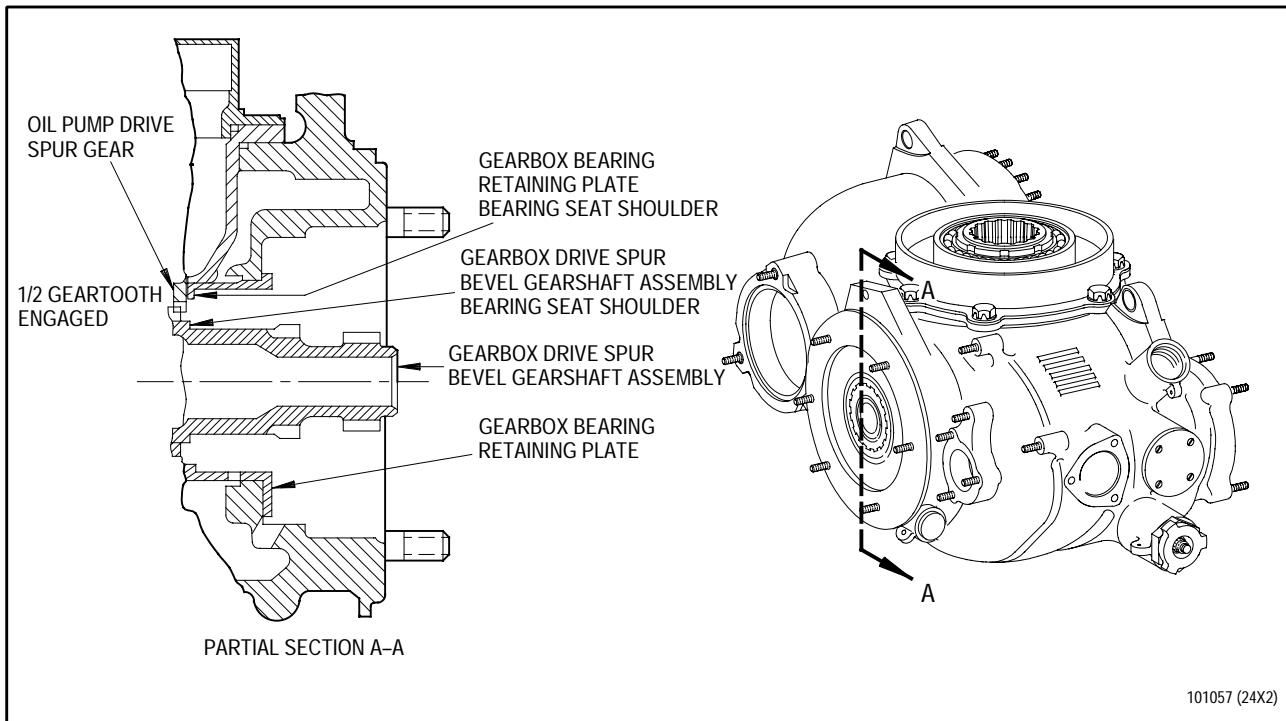


Figure 9. Gearbox Spur Bevel Gearshaft Assembly and Oil Pump Drive Spur Gear



If the gearshaft assembly is not held by hand or supported during removal, damage to gearshaft assembly will occur.

- (9) Install PWA 57050 puller onto gearshaft clamping it to bearing inner race puller to push shaft out of bearing. The gearshaft must be held by hand and supported during removal to prevent damage. Repeat assembly procedures starting at step c.
- (10) Apply light coat of lubricating oil to aft gearshaft assembly threads and nut(16, figure 7). Install nut and torque to 950 to 1050 pound-inches using PWA 57048 wrench to fully seat bearing inner race on gearshaft assembly.
- (11) Verify bearing inner race is seated by measuring from end of gearshaft assembly to bearing inner race. Measurements must be taken on flat surface of inner race only, avoiding raised markings. Record this measurement as Dimension X. See figure 6. The inner race is properly seated if Dimension H minus Dimension C is no greater than 0.002 inches or less than 0.001 inches of Dimension X.
- (12) Remove nut(16, figure 7).
- (13) If bearing inner race is properly seated with gearshaft assembly, proceed to step (14). If bearing inner race is not properly seated with gearshaft assembly, repeat steps (10) through (12). If seating is not possible by second attempt, remove bearing nut and remove PWA 57049 torque adapter without moving gearbox assembly. Be sure to hold and support PWA 57049 while loosening nuts. Start assembly over beginning at step h(9).
- (14) Measure axial distance from gearbox housing to bearing outer race face record as Dimension W, figure 6 (gearshaft installed). Outer race is properly seated if Dimension W, previously recorded at step f(1), is within  $\pm 0.001$  inches. If properly seated, continue with assembly procedure step h(17).

(15) If bearing outer race is not properly seated, proceed as follows:

- (a) Remove centering pin on PWA 56556 detail-2 adapter and install adapter against bearing. Ensure step on adapter seats with bearing inner and outer races, and cut-out on adapter aligns with dowel pin on gearbox bearing retaining plate to prevent suppression of dowel pin.
- (b) Install PWA 56556 detail-10 ring onto gearbox housing assembly flange.
- (c) Install PWA 56556 detail-3 hydraulic cylinder onto detail-19 base.
- (d) Install PWA 56556 detail-19 base on gearbox housing assembly ensuring round part of base is butted against ring. Secure base using PWA 56556 detail-13 nuts.



Exceeding specified hydraulic pressure limit may cause damage to engine hardware.

- (e) Connect PWA 55380 hand pump and actuate pump handle to push gearbox retaining plate and bearing assembly until gearbox retaining plate and bearing seat to gearbox housing assembly. Seating is evidenced by rapid rise in hydraulic pressure. Do not exceed 1000 psig pressure.

(16) Remove PWA 56556 pusher/puller tooling in reverse order of installation.

Repeat bearing outer race measurement, starting at assembly procedure step h(14).

(17) Secure gearbox drive spur bevel gearshaft assembly as follows:

- (a) Apply light coat of lubricating oil or equivalent to nut side of key washer(15). Install key washer and nut(16) fingertight.
- (b) With PWA 57049 torque adapter installed, secure gearshaft assembly(1) while nut is tightened.
- (c) Mark key washer and adjacent surface using metal marking crayon so any rotation of key washer can be detected when torquing nut.
- (d) Install PWA 57048 wrench over gearshaft assembly and engage nut. Torque nut to 425 to 475 pound-inches
- (e) Check index marks to ensure key washer has not rotated and sheared tabs. If key washer tabs shear then replace key washer. Remove index marks.
- (f) Crimp key washer using PWA 56805 crimping tool at four locations 90 degrees apart.
- (g) Install gearbox bearing packing transfer tube. Refer to T.O. 2J-F100-53-11, WP 702 00.

- (h) Flow check retaining plate(5) and oil nozzles(9 and 11). Refer to T.O.2J-F100-53-1, WP 702 00.
- (i) Position new packing(12) into recess in retaining plate(3).
- (j) Install new packing(14) around small OD of packing transfer tube(13).
- (k) With small OD of tube facing up, install tube into retaining plate.
- (l) Install three PWA 50611 aligning pins into retaining plate.
- (m) Install new packing(10) on oil nozzles(9 and 11).
- (n) Install oil nozzles into retaining plate(5) as shown.
- (o) Align dowel pin hole in retaining plate(5) with dowel pin in retaining plate(3). Position plate down over aligning pins and bearing.
- (p) Replace two aligning pins with two tab washers(6) and bolts(8).
- (q) Replace remaining aligning pin with tab washer(6) and bolt(7).
- (r) Torque bolts(7 and 8) 65 to 85 pound-inches. Inspect prebent tabs of tab washers to ensure they are still installed in holes. Bend remaining tabs to secure bolts.





# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARBOX HOUSING (FRONT) -

### INSTALLATION ON GEARBOX HOUSING (REAR)

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	.	.	.	.	6
2	.	.	.	.	0
3	.	.	.	.	6
4 - 13	.	.	.	.	0
14 Blank	.	.	.	.	0

## REFERENCE MATERIAL REQUIRED

Title	Number
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Gearbox Module - Table of Limits and Clearance Charts -	WP 801 00

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Compound antigalling (PWA 36545)	Everlube 382

## EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Gasket	4002729	1
Key washer	4014749	1

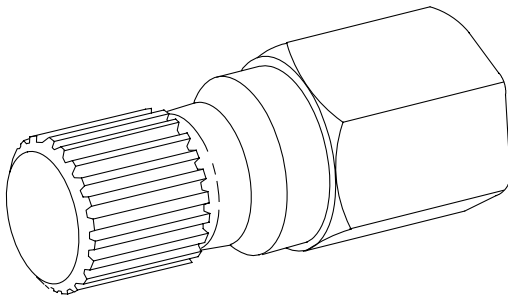
## APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	Installation of Front Gearbox Housing on Rear Gearbox Housing and Taking Backlash Checks	
	Holder, PTO gearshaft - - - - -	PWA 50433
	Holder, Idler stub shaft - - - - -	PWA 50525
	Adapter, PTO gearshaft spur gear - - -	PWA 50526
	Adapter, Deaerator impeller shaft spur gear - - - - -	PWA 50527

## APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
5	Installation of Gearbox Front Housing on Gearbox Rear Housing	
	Holder, PTO gearshaft - - - - -	PWA 50433
6	Gearbox Drive Spur Bevel Gearshaft Assembly to Gearbox Bevel Gearshaft and Gearbox Spur Gearshaft - Backlash Checks	
	Holder, PTO gearshaft - - - - -	PWA 50433
	Adapter, Lower towershaft - - - - -	PWA 50523
	Adapter, PTO gearshaft spur gear - - -	PWA 50526
	Holder, Bevel gearshaft drive fuel pump end - - - - -	PWA 57051
	Fixture (optional), backlash - - - - -	SAALC 8318893

## ILLUSTRATED SUPPORT EQUIPMENT

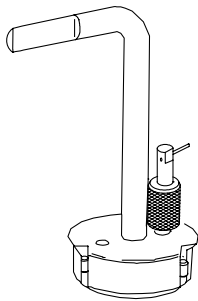


PWA 50433 -C

Figure T1. PWA 50433 Holder

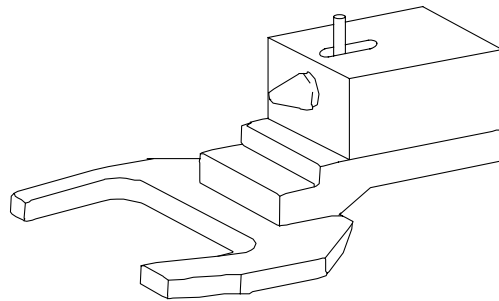
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ILLUSTRATED SUPPORT EQUIPMENT



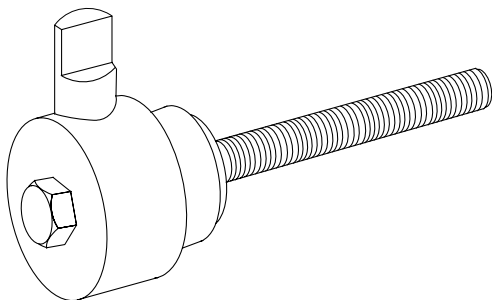
PWA 50523 -C

Figure T3. PWA 50523 Adapter



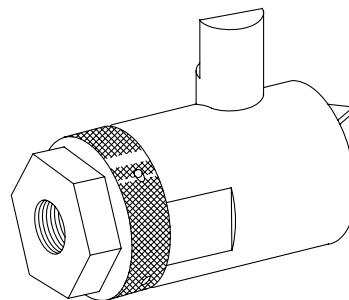
PWA 50525 -C

Figure T4. PWA 50525 Holder



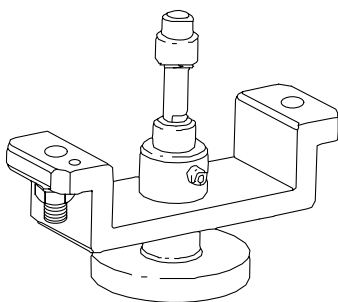
PWA 50526 -C

Figure T5. PWA 50526 Adapter



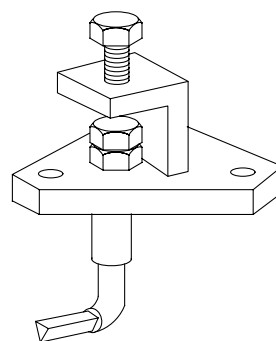
PWA 50527 -C

Figure T6. PWA 50527 Adapter



PWA 57051 -C

Figure T7. PWA 57051 Holder



SAALC 8318893 -C

Figure T8. SAALC 8318893 Fixture

**1. INTRODUCTION.**

- a. This work package contains instructions for installation of front gearbox housing on rear gearbox housing and performing gearshaft backlash checks.

**2. INSTALLATION OF FRONT GEARBOX HOUSING ON REAR GEARBOX HOUSING AND TAKING BACKLASH CHECKS.**

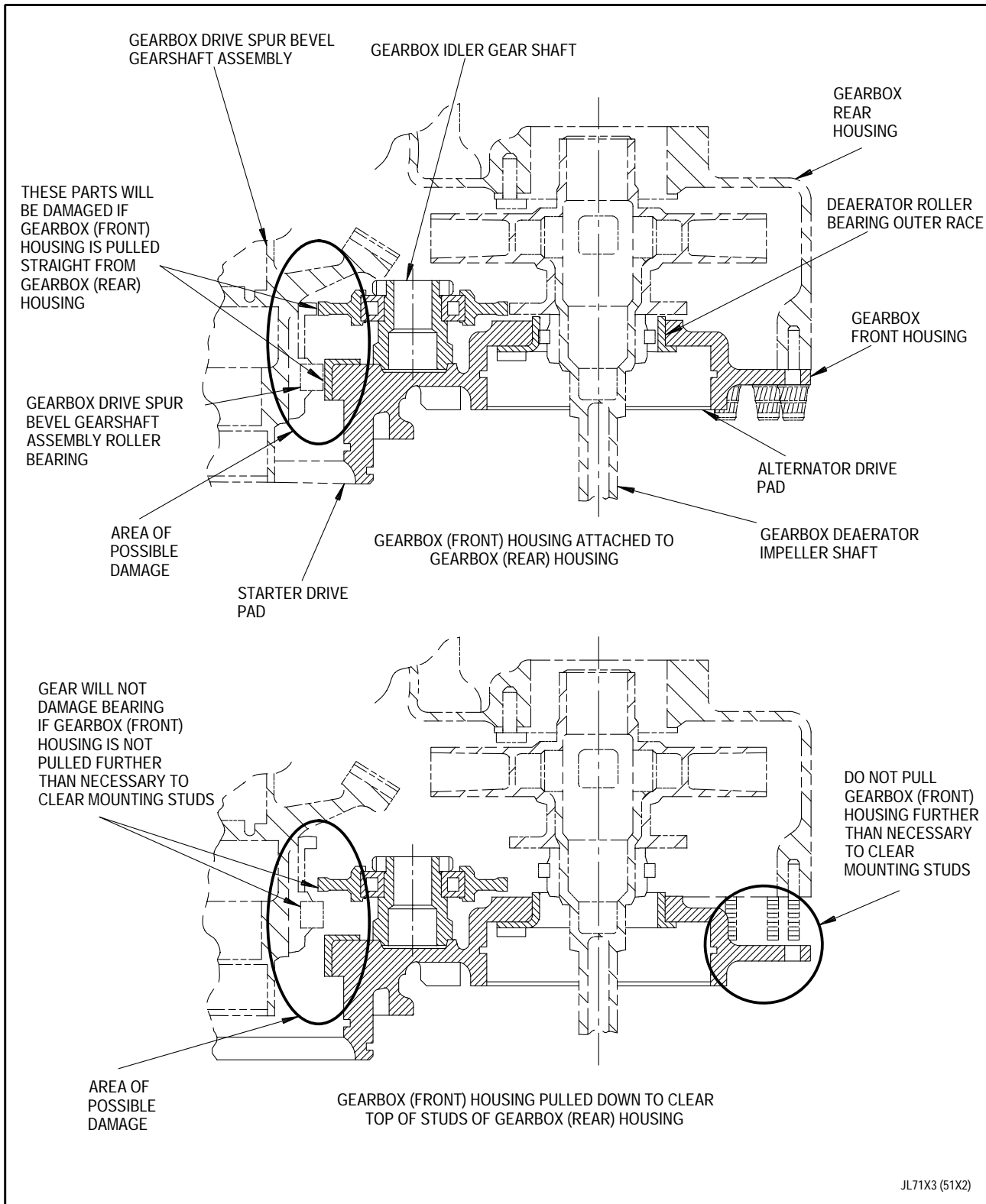
(See Figures 1 and 2.)

- a. Install PWA 50525 holder on gearbox idler gearshaft as follows:
  - (1) Position detail-2 base over base of idler gearshaft, ensuring snug fit.
  - (2) Slide detail-5 pin between gear teeth and tighten setscrew.
- b. Install gearbox front housing on gearbox rear housing as follows:
  - (1) Place PN 4002729 gasket on rear housing.
  - (2) For understanding of possible interferences when installing front housing. See figure 1.

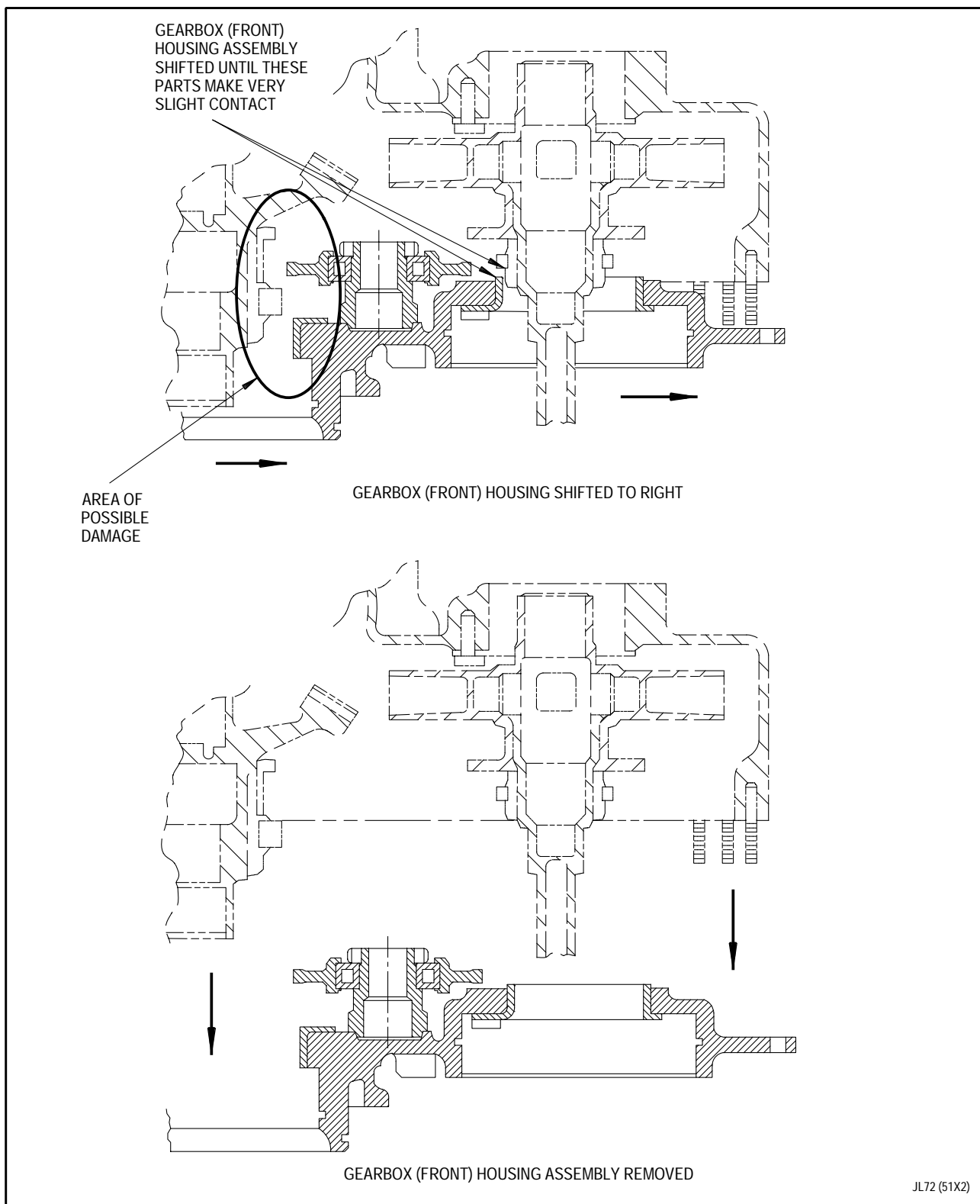


Roller bearing on gearbox drive spur bevel gearshaft assembly will be damaged if front housing is not installed as specified. Ensure detail roller bearings are positioned inward.

- (3) Position gearbox front housing so deaerator impeller shaft protrudes through deaerator roller bearing outer race bore and teeth of gearbox idler gearshaft gear will clear gearbox drive spur bevel gearshaft roller bearing when lowered.
- (4) Carefully lower gearbox front housing while visually ensuring gear clears rollers. When front housing touches top of studs, slide into position and seat on gearbox rear housing. Install PWA 50433 holder into gearbox drive spur bevel gearshaft to turn gears and align gearbox idler gearshaft gear and mating gears on gearbox drive spur bevel gearshaft and deaerator impeller shaft.
- (5) Install washers and work nuts on all gearbox studs. Torque 54 to 60 pound-inches.



**Figure 1. Interference During Installation of Gearbox (Front) Housing on Gearbox (Rear) Housing (Sheet 1 of 2)**



**Figure 1. Interference During Installation of Gearbox (Front) Housing on Gearbox (Rear) Housing (Sheet 2 of 2)**

c. Check deaerator impeller shaft backlash as follows:

- (1) Position PWA 50527 adapter on end of deaerator impeller shaft where two detail lugs fit into two slots at base of shaft, and arm with scribe line points away from starter drive pad. Tighten detail nut to secure adapter.

**NOTE**

Dial indicator mounted on parallel bars is recommended.

- (2) Using a standard indicator setup across alternator drive gearbox pad of front housing and position indicator point on tool scribe line.
- (3) Rock gear back and forth and record backlash. Backlash shall be 0.008 to 0.032 inch. If out of limits, refer to paragraph 3.
- (4) Remove PWA 50527 adapter.

d. Check gearbox drive spur bevel gearshaft backlash as follows:

- (1) Install PWA 50526 adapter assembly detail-1 adapter into front end of gearbox drive spur bevel gearshaft and secure with detail-2 screw. Tighten to secure.

**NOTE**

Dial indicator mounted on parallel bars is recommended.

- (2) Using a standard indicator set up across starter drive pad of gearbox front housing and position indicator point on tool scribe line.
- (3) Rock gear back and forth and record backlash. Backlash shall be 0.0075 to 0.0305 inch. If out of limits, refer to paragraph 3.
- (4) Remove PWA 50526 adapter.



**NOTE**

Gearbox front housing shall be removed so gearbox baffle assembly can be installed.

- e. With gearbox front housing(1) facing up, remove work nuts and washers(2, figure 2) which secure gearbox front housing to gearbox rear housing.



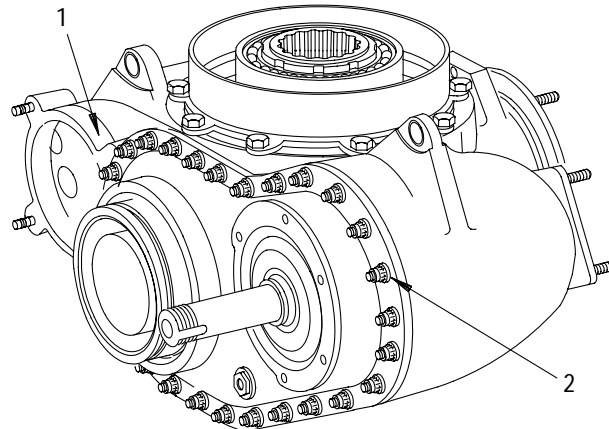
Gearbox front housing shall be lifted, slid, and removed. (See figure 1.) Gearbox idler gearshaft is attached to front housing and if front housing is forced, it will damage gearbox drive spur bevel gearshaft roller bearing.

- (1) Lift gearbox front housing from gearbox rear housing slowly using as little force as possible. When front housing clears studs, carefully slide it to right and when any resistance is felt, back off slightly and pull gearbox front housing slowly from gearbox rear housing. For clearance of idler gearshaft to gearbox drive spur bevel gearshaft roller bearing details, see figure 1.

- (2) Remove gasket carefully. Gasket will be used at final assembly.

- f. Remove PWA 50525 holder from idler gearshaft.

1. GEARBOX FRONT HOUSING  
2. SELF-LOCKING NUTS AND  
PN MS9321-10 FLAT WASHERS



JL001190 (18X2)

**Figure 2. Front Gearbox Housing - Installation**

**3. TROUBLESHOOTING PROCEDURES FOR  
OUT OF LIMITS BACKLASH CHECK.**

- a. Run backlash test again.
- b. Check for proper assembly as follows:
  - (1) Ensure gears, gearshafts, and coupling assemblies are properly seated against bearings.
  - (2) Ensure bearings are properly seated against housings and are not cocked.
  - (3) Ensure bearing retaining nut and bolts have been torqued.
  - (4) Ensure details of separable bearings have same serial numbers. Serial numbers are not to be confused with part numbers.
- c. If properly assembled, proceed as follows:
  - (1) Check existing records to determine which gearshafts or gears have been reworked.
  - (2) Remove gearshafts or gears involved and check dimensions.

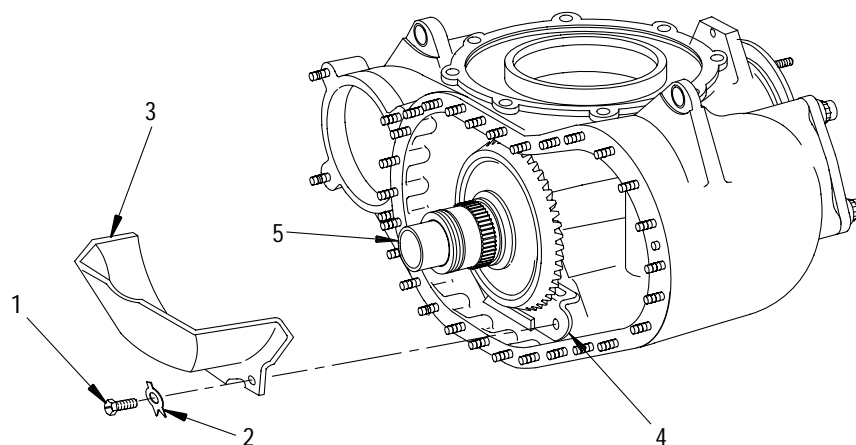
(3) Replace or repair gearshafts or gears which are not dimensionally correct.

- d. If gearshafts or gears are within limits, then gearbox housing will have to be dimensionally inspected and any necessary repairs made.

**4. GEARBOX BAFFLE ASSEMBLY -  
INSTALLATION.**

(See Figure 3.)

- a. Install gearbox baffle assembly(3) as follows:
  - (1) Position gearbox baffle assembly(3) in place over gearbox housing baffle(4).
  - (2) Install key washer(2) with prebent tab in locking hole. Install screw(1). Torque. Ensure prebent tab of key washer is installed in hole. Bend remaining tabs to secure.



INDEX NUMBER	DESCRIPTION	LUBRICATION	TORQUE (LB-IN.)	LOCKWIRE
1	SCREW	LUBRICATING OIL	24 TO 36	-
2	KEY WASHER	-	-	-
3	GEARBOX BAFFLE ASSEMBLY	-	-	-
4	GEARBOX HOUSING BAFFLE	-	-	-
5	GEARBOX DRIVE SPUR BEVEL GEARSHAFT	-	-	-

JL001988 (36X2)

**Figure 3. Gearbox Baffle - Installation**

**5. INSTALLATION OF GEARBOX FRONT HOUSING ON GEARBOX REAR HOUSING.**

(See figure 1.)

- a. Refer to figure 1 for understanding of possible interferences when installing front housing.

**NOTE**

Use same gasket which was used during backlash checks.

- b. Install PN 4002729 gasket on gearbox rear housing.
- c. Position gearbox front housing so deaerator shaft protrudes through deaerator roller bearing outer race bore and teeth of gearbox idler gearshaft will clear gearbox drive spur bevel gearshaft roller bearing when lowered.
- d. Carefully lower gearbox front housing while visually ensuring roller bearing details are positioned inward and gear clears rollers. When housing touches top of studs, slide into position and seat front housing. Use PWA 50433 holder, install into end of gearbox drive spur bevel gearshaft to align gearbox idler gearshaft gears on gearbox drive spur bevel gearshaft and deaerator impeller shaft.

- e. Apply PWA 36545 antigalling compound to threads of studs(2, figure 2).
- f. Install flat washers and nuts(2) on studs of gearbox. Torque 54 to 60 pound-inches.

**6. GEARBOX DRIVE SPUR BEVEL GEARSHAFT ASSEMBLY TO GEARBOX BEVEL GEARSHAFT AND GEARBOX SPUR GEARSHAFT - BACKLASH CHECKS.**

- a. If necessary, rotate gears using PWA 50433 holder installed in end of gearbox drive spur bevel gearshaft so circular cutout in gear web of gearbox spur gearshaft is located centrally when looking into main oil scavenge pump cavity.
- b. Install PWA 57051 holder onto gearbox drive spur bevel gearshaft. Secure holder to starter drive pad with detail bolts without any rotation of gearbox spur gearshaft.

c. Check gearbox bevel gearshaft backlash as follows:

- (1) Install PWA 50523 adapter into bore of gearbox bevel gearshaft and secure firmly so it does not slip using detail clamps and nuts.

**NOTE**

Dial indicator mounted on parallel bars is recommended.

- (2) Using a standard indicator setup and position indicator point on scribe line on arm of tool.
- (3) Rock gear back and forth and record backlash. Backlash shall be 0.027 to 0.085 inch. If out of limits, refer to paragraph 4.
- (4) Remove PWA 50523 adapter.

d. Check gearbox spur gearshaft backlash as follows:

**NOTE**

Dial indicator mounted on parallel bars is recommended.

- (1) Using a standard indicator setup and position indicator point on scribe line on arm of PWA 50526 adapter or use indicator with long stem and SAALC 8318893 backlash fixture (optional).
  - (2) Rock gear back and forth and record backlash. Backlash shall be 0.007 to 0.029 inch. If out of limits, refer to paragraph 3.
- e. Remove tooling.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARBOX -

### PRESSURE CHECK

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 16

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2 . . . . .	22	6 - 12 . . . . .	0	14 - 15 . . . . .	22
3 - 5 . . . . .	14	13 . . . . .	14	16 Blank Added . . . . .	14

## REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - -	T.O. 2J-F100-53-1
Air Flow Check Using PWA 50047 Pneumatic Test Set - General Procedures - - - - -	WP 025 00
Air Flow Check Using Habco 1093005 Portable Air Flow Checker - General Procedures - - - - -	SWP 025 01
Painting, Zinc Chromate Primer (AMS 3110) (SPOP 157) - -	SWP 097 10
Gearbox Module - - - - -	T.O. 2J-F100-53-11
Gearbox Module - Tables of Limits and Clearance Charts -	WP 801 00

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

## CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
COMPOUND, ANTIGALLING (PWA 550)	HI-T-650 OR LUBRI-BOND HT
COMPOUND, SEALING (PWA 36000-3)	HYLOMAR PL-32
LOCKWIRE(0.032 INCH DIAMETER)	MS9226-04
OIL, LUBRICATING	MIL-L-7808
PRIMER, ZINC CHROMATE (AMS 3110)	TT-P-1757

## EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
KEY WASHER	171752	8
PACKING	NAS-1593-012	2
PACKING	ST1000-048	1
PACKING	ST1000-154	3
PACKING	ST1000-155	1
PACKING	ST1001-010	1
PACKING	ST1001-04	1
PACKING	ST1001-08	2



## APPLICABLE SUPPORT EQUIPMENT

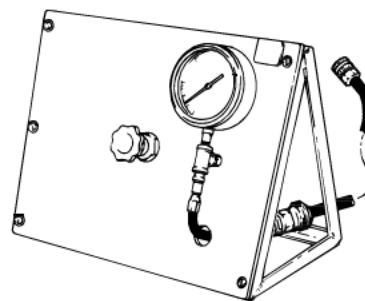
Paragraph	Function - Tool Nomenclature	Tool Number
5	GEARBOX PRESSURE CHECK	
	COVER, BREATHER PRESSURIZING VALVE AIR PRESSURE CHECK (LOCALLY MANUFACTURED) - - - - -	PWA 57073
	PLUG, BEVEL GEARSHAFT BORE - - - - -	PWA 57101
	ADAPTER, REDUCTION GEARBOX AIR FLOW - - - - -	PWA 57182
	ADAPTER - - - - -	SAALC X9053739
	COVER, OIL PUMP PAD AIR PRESSURE CHECK - - - - -	PWA 51134
	COVER, TOWERSHAFT SEALING SLEEVE AIR PRESSURE CHECK - - - - -	PWA 51135
	ADAPTER - - - - -	SAALC X9053740
	REGULATOR ASSEMBLY, AIR SOURCE - - - - -	PWA 21875
	ADAPTER, BREATHER LINE AIR PRESSURE CHECK - - - - -	PWA 51103
	CONNECTOR, PRESSURE CHECK - - - - -	PWA 52838
		OR
	CONNECTOR, PRESSURE CHECK - - - - -	SAALC X8620799
	TEST SET, PNEUMATIC PRESSURE CART - - - - -	PWA 50047
		OR
	PORTABLE AIR FLOW CHECKER - - - - -	HABCO 1093005
	HOLDER, PTO GEARSHAFT - - - - -	PWA 50433
	COVER, GEARBOX PUMP AIR CHECK - - - - -	PWA 57074

## ILLUSTRATED SUPPORT EQUIPMENT



HABCO 1093005 -C

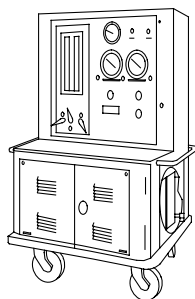
Figure T1. HABCO 1093005 PORTABLE AIR FLOW CHECKER



PWA 21875 -C

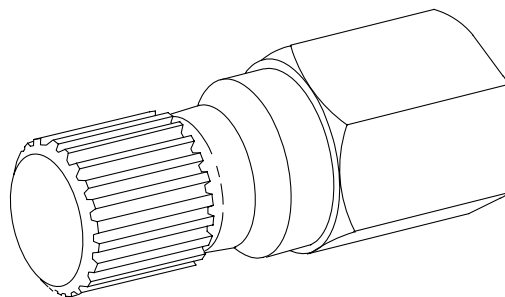
Figure T2. PWA 21875 REGULATOR ASSEMBLY

ILLUSTRATED SUPPORT EQUIPMENT (continued)



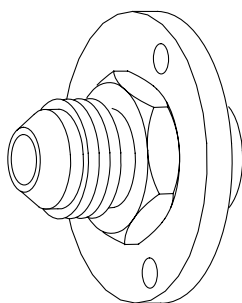
PWA 50047 -C

**Figure T3. PWA 50047 TEST SET**



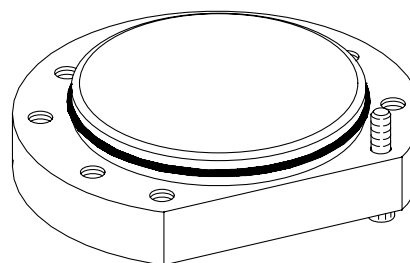
PWA 50433 -C

**Figure T4. PWA 50433 HOLDER**



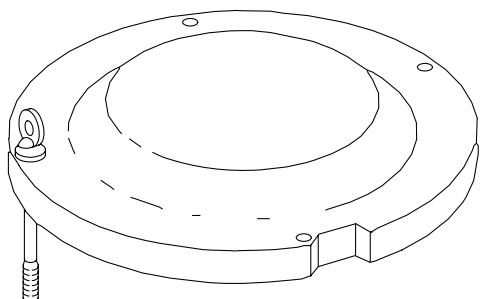
PWA 51103 -C

**Figure T5. PWA 51103 ADAPTER**



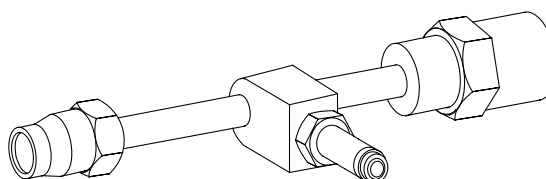
PWA 51134 -C

**Figure T6. PWA 51134 COVER**



PWA 51135 -C

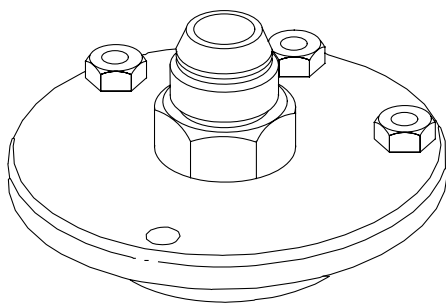
**Figure T7. PWA 51135 COVER**



PWA 52838 -C

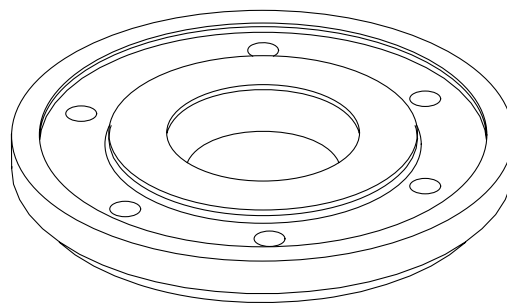
**Figure T8. PWA 52838 CONNECTOR**

**ILLUSTRATED SUPPORT EQUIPMENT (continued)**



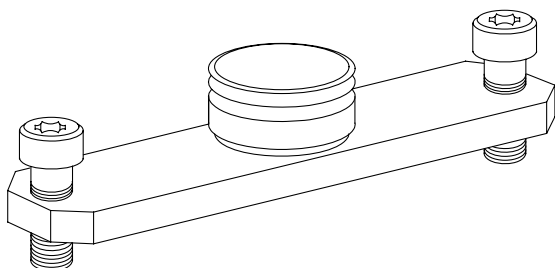
PWA 57073 -C

**Figure T9. PWA 57073 COVER**



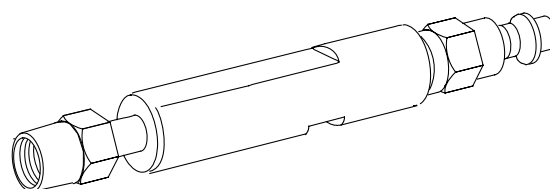
PWA 57074 -C

**Figure T10. PWA 57074 COVER**



PWA 57101 -C

**Figure T11. PWA 57101 PLUG**



PWA 57182 -C

**Figure T12. PWA 57182 ADAPTER**

## 1. INTRODUCTION.

- a. This work package contains instructions for the following:

(1) Installation of bushings, connectors, adapters, inserts and chip detectors in bosses.

(2) Installation of oil seal retainers in gearshaft ports.

(3) Pressure check of gearbox.

## 2. GEARBOX EXTERNAL PARTS - INSTALLATION.

(See Figures 1 and 2.)

- a. Coat PN ST1001-08 packing(2, figure 1) with MIL-L-7808 lubricating oil.
- b. Install packing on insert(1). Coat mating surfaces of insert and gearbox housing with wet zinc chromate primer (AMS 3110). Refer to T.O. 2J-F100-53-1, WP 097 10.
- c. Install insert(1) and torque 200 to 250 pound-inches.
- d. Install detail check valve(5) and metal chip detector(3) as follows:
- (1) If applicable remove chip detector(3) from check valve(5).

(2) Coat PN ST1001-10 packing(6) with MIL-L-7808 lubricating oil.

(3) Install packing(6) on OD of detail check valve(5).

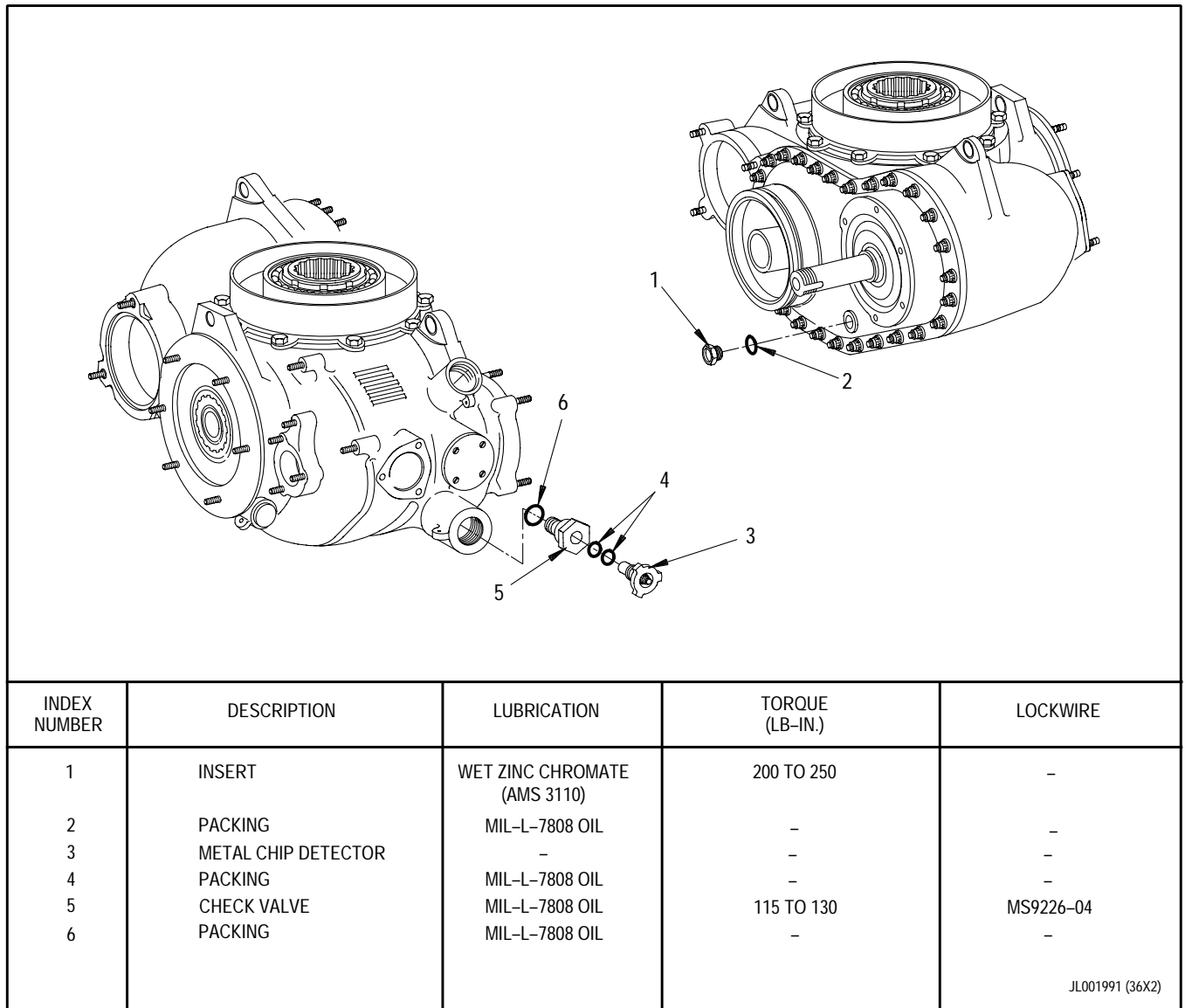


Ensure detail check valve is properly lockwired. If not properly lockwired, chip detector assembly can become loosened during engine operation, resulting in oil loss and damage to engine bearings.

(4) Install detail check valve. Torque 115 to 130 pound-inches. Lockwire detail check valve using PN MS9226-04 wire.

(5) Coat two PN NAS-1593-012 packings(4) with MIL-L-7808 lubricating oil.

(6) Install two packings(4) onto metal chip detector(3).



**Figure 1. Gearbox Assembly - External Parts Installation**

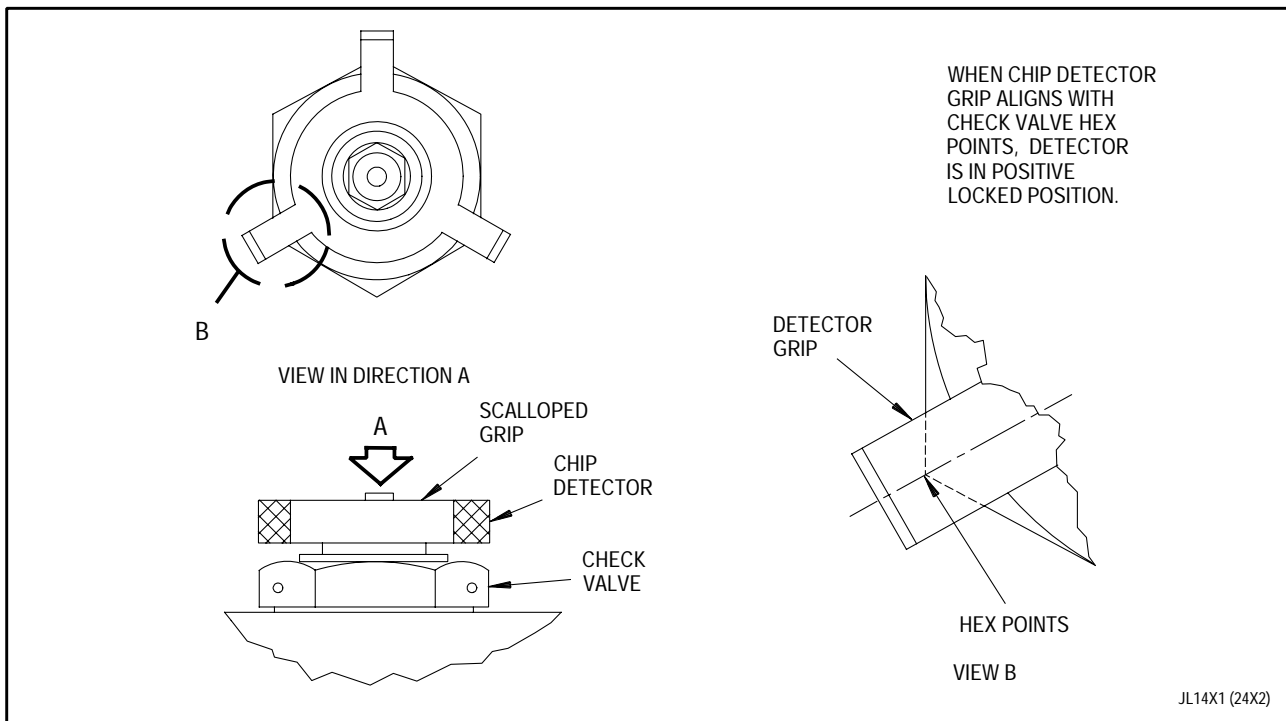


Ensure chip detector is properly installed in positive locked position. (See figure 2.) If not properly installed, chip detector can loosen during engine operation, resulting in oil loss and damage to engine bearings.

#### NOTE

There are two configurations of metal chip detectors. One configuration has a knurled grip and the other has a scalloped grip. Positive locking indications are different for each design. (See figure 2.)

- (7) Align three lugs of metal chip detector(3, figure 1) with three slots in detail check valve(5). Depress chip detector(3), turn clockwise; ensure metal chip detector is positively locked. (See figure 2.)



**Figure 2. Metal Chip Detector Installation Alignment**

### 3. GEARBOX OIL SEAL RETAINERS - INSTALLATION.

(See Figure 3.)

- a. Coat PN ST1000-154 packings(5, figure 3) with MIL-L-7808 lubricating oil.
- b. Install packings(5) in groove of oil seal retainer(4).
- c. Using mallet, tap oil seal retainer(4) into housing taking care not to cock oil seal.
- d. Coat PN ST1000-154 packing(3) with lubricating oil.
- e. Install packing(3) into groove of packing cover(2).
- f. Using mallet, tap packing cover(2) into housing taking care not to cock.
- g. Install retaining ring(1) to secure.
- h. Coat PN ST1000-154 packing(8) with MIL-L-7808 lubricating oil.
- i. Install packing(8) into groove of oil seal retainer(7).
- j. Using mallet, tap oil seal retainer(7) into housing taking care not to cock.
- k. Secure seal retainer(7) with retaining ring(6).
- l. If gearbox is not to be preserved, cap all openings except fuel pump and starter drive pads, and scavenge pump opening.

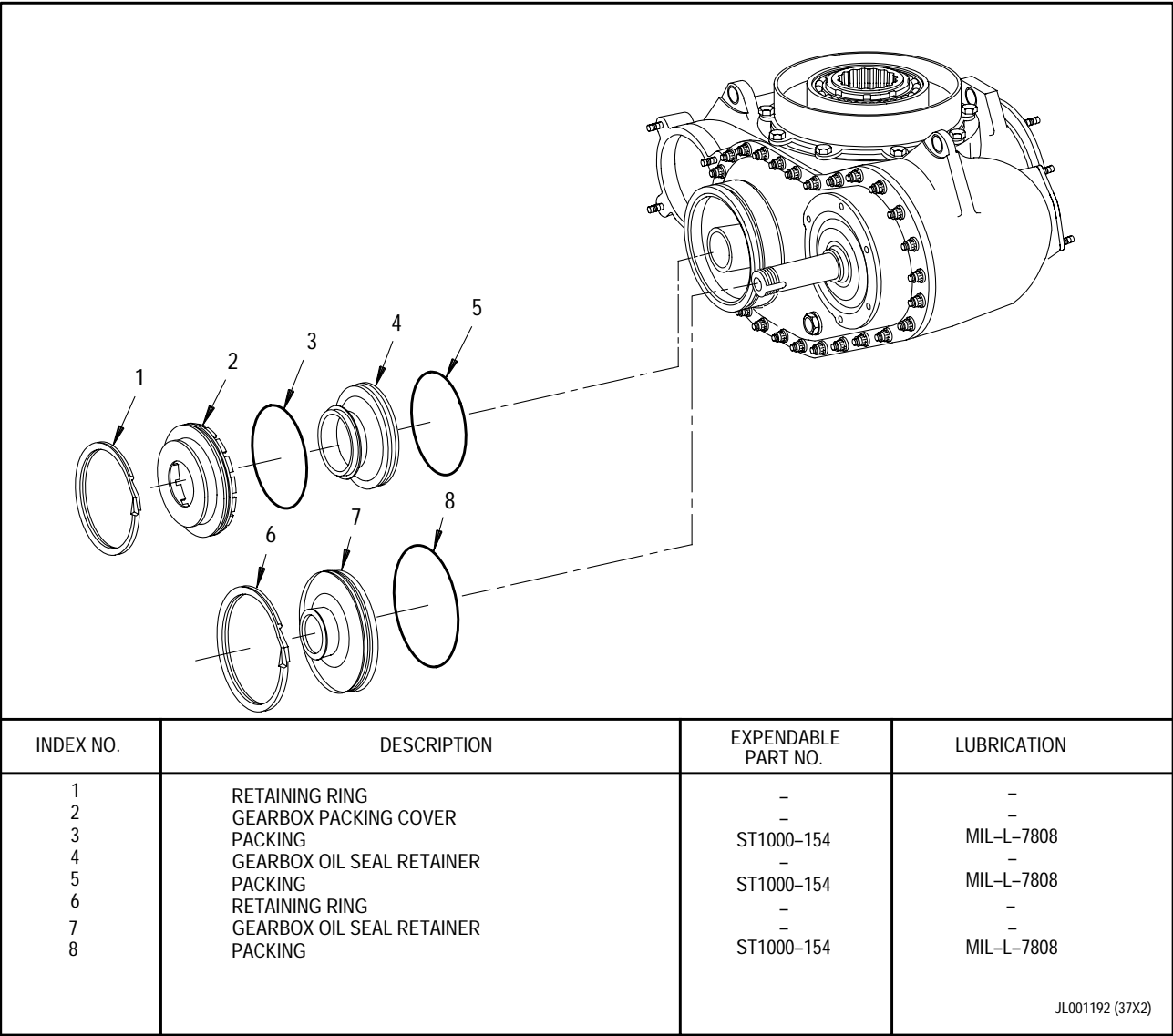


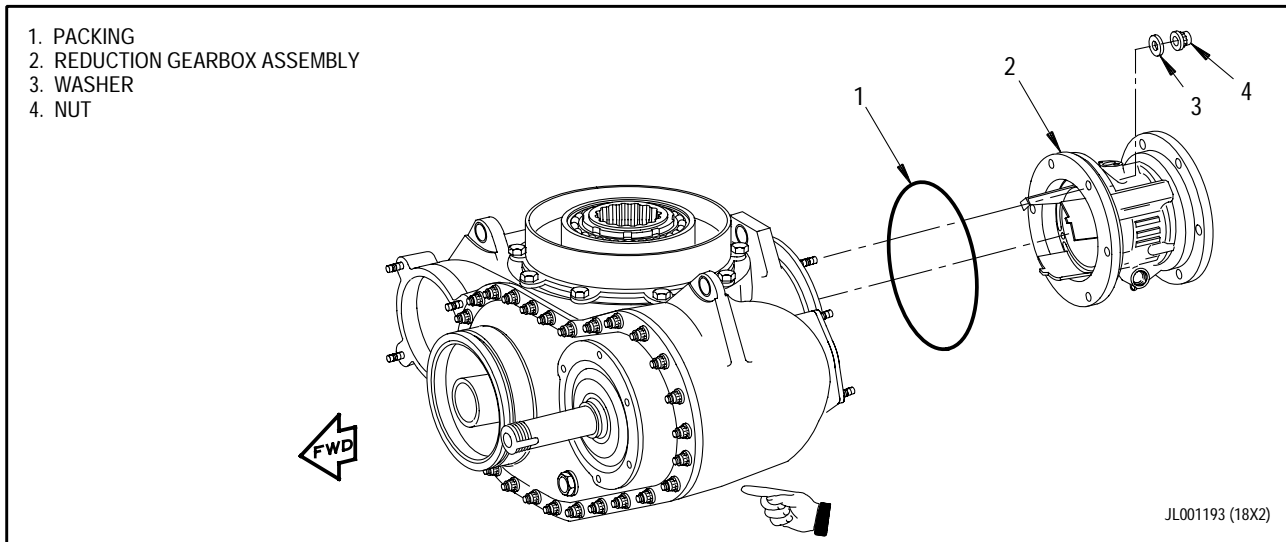
Figure 3. Gearbox Oil Seal Retainers - Installation



#### 4. REDUCTION GEARBOX ASSEMBLY - INSTALLATION.

(See Figure 4.)

- a. Coat PN ST1000-048 packing(1) with MIL-L-7808 lubricating oil.
- b. Install packing(1), into groove on reduction gearbox assembly forward mount flange.
- c. Coat studs on rear mount flange of main gearbox assembly with PWA 550 antigalling compound.
- d. Install reduction gearbox assembly(2) on rear mount flange of main gearbox assembly.
- e. Install washers(3) and nuts(4). Torque nuts 190 to 215 pound-inches.
- f. Using 0.001 inch feeler gage or sheet stock, inspect gap between reduction gearbox housing and main gearbox housing at three cutout locations. If feeler gage or sheet stock can be inserted to a depth of 0.500 inch, packing is not properly installed. Repeat installation procedure using new packing.



**Figure 4. Reduction Gearbox Assembly - Installation**

## 5. GEARBOX PRESSURE CHECK.

(See Figure 5.)

### NOTE

Check tool adapters and cover for damage or deterioration of packings. Replace packings as required.

- a. Install PWA 57073 cover in breather dome(3, figure 5) of gearbox. Secure with detail nuts.
- b. Install PWA 57101 plug in rear end of reduction gearbox assembly(4). Secure plug to flange using detail nuts and bolts.

c. Position PWA 51134 cover over gearbox scavenge pump pad(8) aligning bolt holes. Secure with detail screws.

d. Position PWA 51135 cover over sealing sleeve(5) aligning bolts of cover with four vacant holes in sealing sleeve. Secure cover in place by tightening cover bolts.

e. Cap all fittings on gearbox with standard caps.

**NOTE**

Leak check procedure using engine oil, step f, is optional and not required if airflow check, step g, is performed.

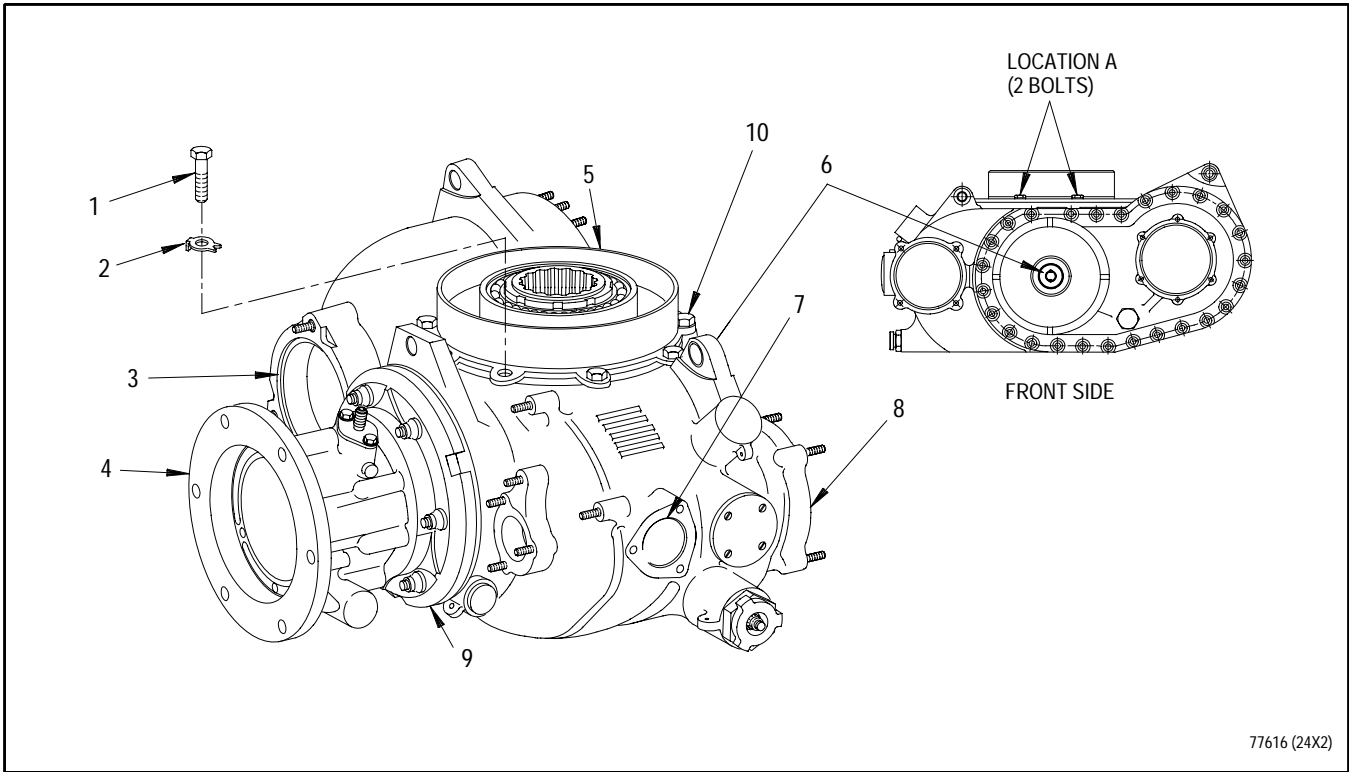
f. Perform leakage check as follows:

- (1) Plug starter drive gearshaft(6) with locally manufactured plug made of a 4 inch long 0.437-20 bolt, two locknuts and a ST1000-04 packing.
- (2) Install SAALC X9053740 adapter in breather line flange(7) of gearbox and secure using nuts and washers. SAALC X9053740 adapter is locally manufactured as follows:
  - (a) Drill and tap PN 4037945 plug to accept LL-10 quick disconnect fitting.
  - (b) Install quick disconnect fitting in plug.
  - (c) Install PN ST1000-218 packing on plug.
- (3) Connect SAALC X9053740 adapter to PWA 21875 regulator.
- (4) Perform leak check with PWA 21875 regulator set at 10 psig. Check for leaks by applying engine oil around carbon seal, shaft, flanges, plumbing fittings and external surface of housing. Correct leakage as necessary. If no leakage is found, go to step h.
- (5) Remove nuts, washers, and SAALC X9053740 adapter from breather line flange(7).

- (6) Remove locally manufactured plug from starter drive gearshaft(6).

g. Perform airflow check as follows:

- (1) Install PWA 51103 adapter in breather line flange(7) of gearbox and secure with nuts and washers.
- (2) Connect PWA 52838 connector or SAALC X8620799 connector to PWA 51103 adapter in gearbox.
- (3) If PWA 50047 pneumatic test set is to be used, perform self-test per T.O. 2J-F100-53-1, WP 025 00.
- (4) Connect air hoses from PWA 50047 pneumatic test set per T.O. 2J-F100-53-1, WP 025 00 or Habco 1093005 portable air flow checker per T.O. 2J-F100-53-1, WP 025 01, to PWA 52838 connector or SAALC X8620799 connector.
- (5) Perform airflow check with pressure set at 10 psig.
- (6) Rotate gear train 8 to 10 turns using PWA 50433 holder, splined into starter drive gearshaft(6). Remove holder.
- (7) Plug starter drive gearshaft(6) with locally manufactured plug made of 4 inch long 0.437-20 bolt, two locknuts and ST1000-04 packing.



Index Number	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Bolt	See text.	75 to 85	-
2.	Tab washer	-	-	-
3.	Breather dome	-	-	-
4.	Reduction gearbox assembly	-	-	-
5.	Sealing sleeve	-	-	-
6.	Starter drive gearshaft	-	-	-
7.	Breather line flange	-	-	-
8.	Gearbox scavenge pump pad	-	-	-
9.	Main gearbox rear flange	-	-	-
10.	Bolt	see text	65 to 85	MS9226-04

Figure 5. Bolt Installation after Gearbox Pressure Check

- (8) Maximum allowable airflow leakage is 1.0 pph.
- (9) Check for leaks around carbon seals, shaft, flanges, plumbing fittings, and external surface of housing. Correct as necessary to bring leakage within limits.
- (10) If leakage limit is exceeded, remove reduction gearbox assembly(4). Refer to WP 011 00. Install PWA 57074 cover on studs of main gearbox rear flange(9). Secure cover using detail nuts. Repeat step g to determine if leakage is in main gearbox.
- h. Remove tooling.
- i. Install protective covers on all openings.
- j. Remove gearbox from stand.
- k. Apply PWA 36000-3 sealing compound to bolts(1) at through hole location. Let dry for 10 minutes. Install bolts(1) and key washers(2) in sealing sleeve(5). Torque.
- l. Bend tabs of key washers(2).
- m. Install lockwire to bolts(10) at location A.



# WORK PACKAGE

## TECHNICAL PROCEDURES

### GEARBOX STORAGE OR SHIPMENT PREPARATION

EFFECTIVITY: ENGINE MODEL F100-PW-229

## LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	0	4 Blank	0		

**REFERENCE MATERIAL REQUIRED**

None

**APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS**

None

**CONSUMABLE MATERIALS**

**Nomenclature**

**Specification/Vendor Part Number**

Oil, lubricating

MIL-L-7808

**EXPENDABLE ITEMS**

None

**APPLICABLE SUPPORT EQUIPMENT**

None

**ILLUSTRATED SUPPORT EQUIPMENT**

None



**1. INTRODUCTION.**

- a. This work package contains instructions for preparation of gearboxes which are to be stored or shipped.

**2. GEARBOX STORAGE OR SHIPMENT PREPARATION.**

**NOTE**

Gearboxes which are to be shipped not installed on engines, or stored for period of seven days or more, shall be preserved.

- a. Cap all openings except breather valve opening.

- b. Position gearbox so breather valve opening is facing up.
- c. Fill gearbox with MIL-L-7808 lubricating oil.
- d. Cap breather valve opening and turn gearbox over to ensure oiling of all interior parts.
- e. Drain oil from gearbox and recap all openings.



**WORK PACKAGE****TECHNICAL PROCEDURES****GEARBOX MODULE EXTERNAL COMPONENTS -****INSTALLATION****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 30

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 . . . . .	20	10A Added . . . . .	20	21 . . . . .	0
2 - 3 . . . . .	14	10B Blank Added . . . . .	20	22 . . . . .	1
4 . . . . .	0	11 - 14 . . . . .	0	23 . . . . .	0
5 - 7 . . . . .	14	15 - 16 . . . . .	3	24 . . . . .	1
8 . . . . .	0	17 - 19 . . . . .	11	25 - 27 . . . . .	0
9 - 10 . . . . .	20	20 . . . . .	12	28 . . . . .	14

## REFERENCE MATERIAL REQUIRED

None

## APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229-502	28 FEB 92	O/I	Retrofit of redesigned oil supply tube to prevent misalignment, F100-PW-229 Engine, F-15/F-16 Aircraft (CP 91QA144)
2J-F100229(V)-501	01 JAN 95	O/I	Incorporation of 30 micron oil filter with full-flow bypass valve, F100-PW-229 Engines, F-15/F-16 Aircraft (ECP 90QA168C1)

## CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
COMPOUND, ANTIGALLING (PWA 36545)	EVERLUBE 382
COMPOUND, ANTIGALLING (PWA 550)	HI-T-650 OR LUBRI-BOND HT
COMPOUND, SEALING (PWA 36000-2 OR PWA 36000-3)	HYLOMAR UNIVERSAL JOINTING COMPOUND PL-32
CRAYON, MARKING	COLORBRITE 2101
ISOPROPYL, ALCOHOL (PMC 9094)	TT-I-735
LOCKWIRE(0.032 INCH DIAMETER)	MS9226-04
OIL, LUBRICATING OR PETROLATUM	MIL-L-7808 VV-P-236

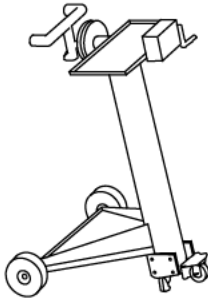
## EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
ELEMENT, FILTER	AC-9348F-1630	1
GASKET	4015507	1
KEY WASHER	171752	2
KEY WASHER	4067181	1
PACKING	M83248/1-023	1 OR 3
PACKING	M83248/1-144	1
PACKING	ST1000-153	1
PACKING	ST1000-214	2
PACKING	ST1001-04	2
PACKING	ST1050-016	1
PACKING	ST1050-145	1
PACKING	ST1051-10	3

## APPLICABLE SUPPORT EQUIPMENT

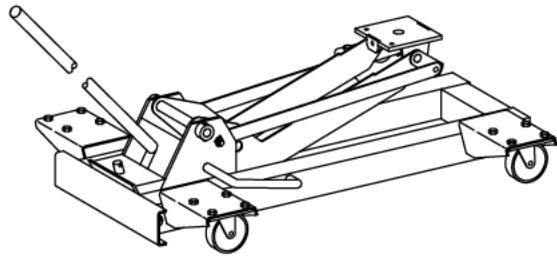
Paragraph	Function - Tool Nomenclature	Tool Number
2	GEARBOX - INSTALLATION IN STAND	
	ADAPTER, HOLDING, MAIN GEARBOX BUILD AND TRANSFER	PWA 50473
	STAND, MAIN GEARBOX - - - - -	PWA 57412
		OR
	STAND, MAIN GEARBOX - - - - -	PWA 27606
		OR
	STAND, GEARBOX ASSY - - - - -	PWA 21816
	FIXTURE, HANDLING, GEARBOX MODULE - - - - -	PWA 57071
	FIXTURE, HANDLING, MAIN GBX MODULE AND FUEL PUMP -	PWA 56579
		OR
	FIXTURE, HANDLING, GEARBOX MODULE - - - - -	PWA 57071
3	No. 2 AND 3 BEARING (GEARBOX) SCAVENGE PUMP - INSTALLATION	
	HOLDER, GEARBOX SCAVENGE PUMP TO GEARBOX - - - - -	PWA 50482
	HOLDER, PTO GEARSHAFT - - - - -	PWA 50433
5	MAIN OIL PUMP - INSTALLATION	
	ADAPTER, TORQUE, SPUR GEAR - - - - -	PWA 55419
9	REMOTE GEARBOX DRIVESHAFT COUPLING - ALIGNMENT AND INSTALLATION	
	INDICATOR, GEARBOX DRIVESHAFT COUPLING RUNOUT - - -	PWA 55712
	ADAPTER, TORQUE - - - - -	PWA 57388
		OR
	ADAPTER, TORQUE - - - - -	SAALC X8869968
10	GEARBOX MODULE - REMOVAL FROM BUILD STAND	
	FIXTURE, HANDLING, MAIN GBX MODULE AND FUEL PUMP -	PWA 56579
		OR
	FIXTURE, HANDLING, GEARBOX MODULE - - - - -	PWA 57071
	JACK - - - - -	PWA 24667

ILLUSTRATED SUPPORT EQUIPMENT



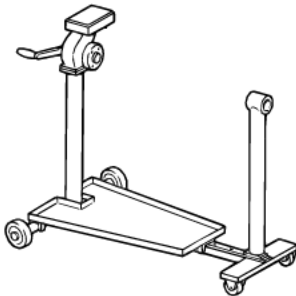
PWA 21816 -C

Figure T1. PWA 21816 STAND



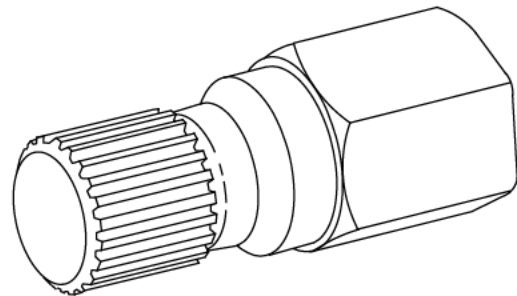
PWA 24667 -C

Figure T2. PWA 24667 JACK



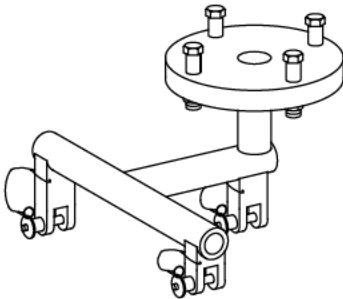
PWA 27606 -C

Figure T3. PWA 27606 STAND



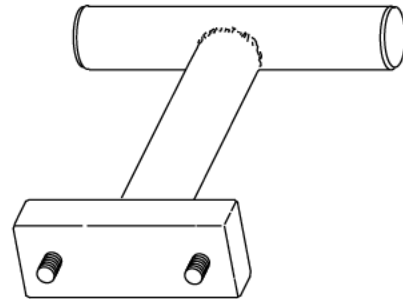
PWA 50433 -C

Figure T4. PWA 50433 HOLDER



PWA 50473 -C

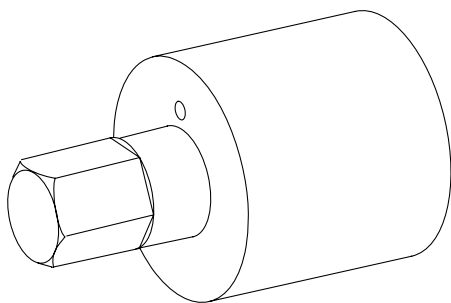
Figure T5. PWA 50473 ADAPTER



PWA 50482 -C

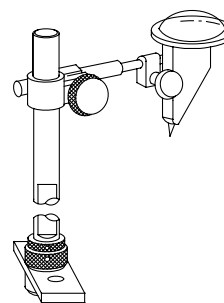
Figure T6. PWA 50482 HOLDER

ILLUSTRATED SUPPORT EQUIPMENT (continued)



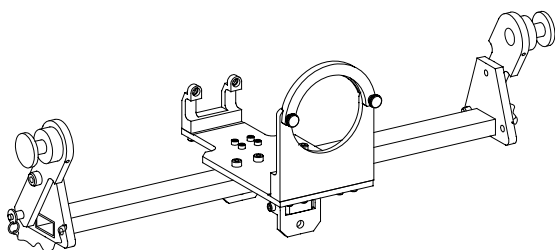
PWA 55419 -C

Figure T7. PWA 55419 ADAPTER



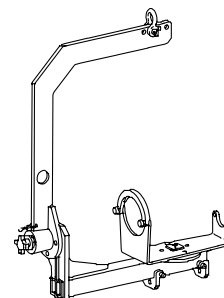
PWA 55712 -C

Figure T8. PWA 55712 INDICATOR



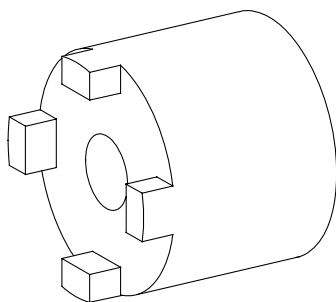
PWA 56579 -C

Figure T9. PWA 56579 FIXTURE



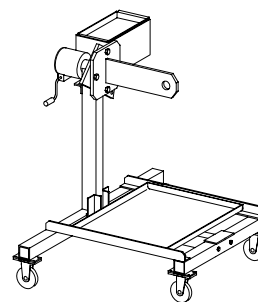
PWA 57071 -C

Figure T10. PWA 57071 FIXTURE



PWA 57388 -C

Figure T11. PWA 57388 ADAPTER



PWA 57412 -C

Figure T12. PWA 57412 STAND

## 1. INTRODUCTION.

a. This work package contains instructions for installing external component assemblies on gearbox to form a complete gearbox module, these parts include:

- (1) No. 2 and 3 bearing gearbox scavenge pump.
- (2) Oil tank scavenge tube connector.
- (3) Main oil pump.
- (4) Oil filter.
- (5) Breather pressurizing valve assembly.
- (6) Remote gearbox driveshaft coupling.

## 2. GEARBOX - INSTALLATION IN STAND.

(See Figure 1.)

### NOTE

Gearbox is mounted into build stand before installing external components.

a. Install PWA 50473 adapter(3, figure 1) to PWA 57412 stand(4).

### NOTE

Secure PWA 56579 handling fixture per step b., or PWA 57071 handling fixture per step c. onto gearbox.

b. Attach PWA 56579 handling fixture as follows:

- (1) Remove support clamp(6) from PWA 56579 fixture(5) prior to installation.

- (2) Position the two retainer lugs over the two nuts securing reduction gearbox assembly to main gearbox housing. Tilt fixture slightly to slip over nuts.

- (3) Install opposite end of tool into PTO housing groove. Reinstall support clamp and secure hand knobs.

- (4) Adjust trunion arms as required to optimize center of gravity.

c. Attach PWA 57071 handling fixture as follows:

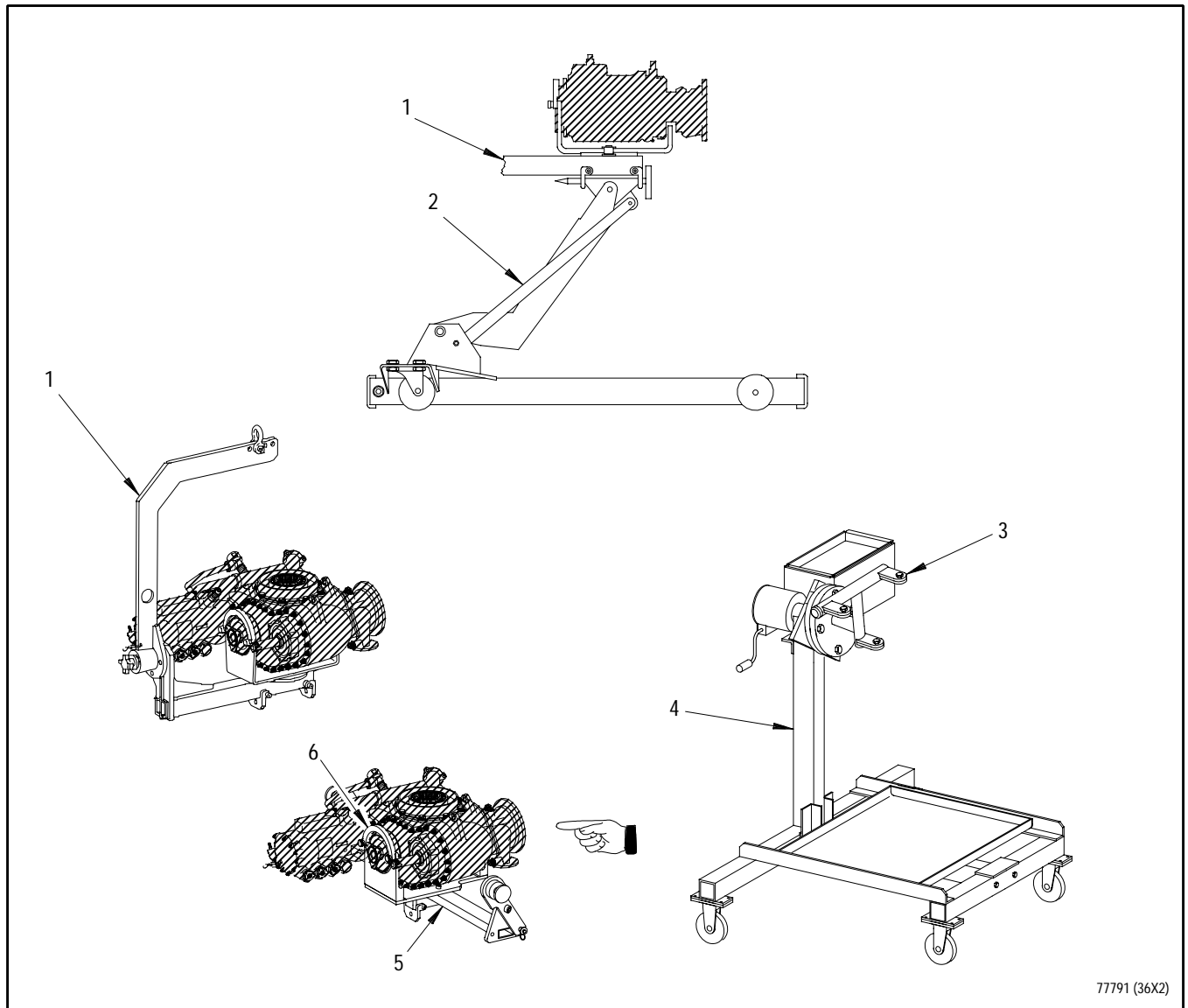
- (1) Align PWA 57071 fixture(1) bracket holes with reduction gearbox drive pad nuts. Attach fixture support clamp to main gearbox at grooved boss of starter drive pad. Secure with two hand knobs.

- (2) Attach separable overhead handling arm to fixture by sliding arm on fixture pivot journal and securing with ball lock pin.

d. Attach hoist to PWA 56579 trunions or PWA 57071 handling arm and carefully lift module. Position and secure module to stand by fitting housing lugs into clevises of stand adapter and locking in place with ball lock pins.

e. Detach hoist and remove handling fixture.





77791 (36X2)

1. PWA 57071 handling fixture
2. PWA 24667 ground handling jack
3. PWA 50473 adapter
4. PWA 57412 stand
5. PWA 56579 handling fixture
6. Support clamp

**Figure 1. Gearbox Installation In Stand**

### 3. No. 2 AND 3 BEARING (GEARBOX) SCAVENGE PUMP - INSTALLATION.

(See Figures 2 through 4.)

#### NOTE

Holder is used to rotate  
scavenge pump and engage gears  
during installation.

- a. Using detail bolts, fasten  
PWA 50482 holder to scavenge  
pump(1, figure 2).

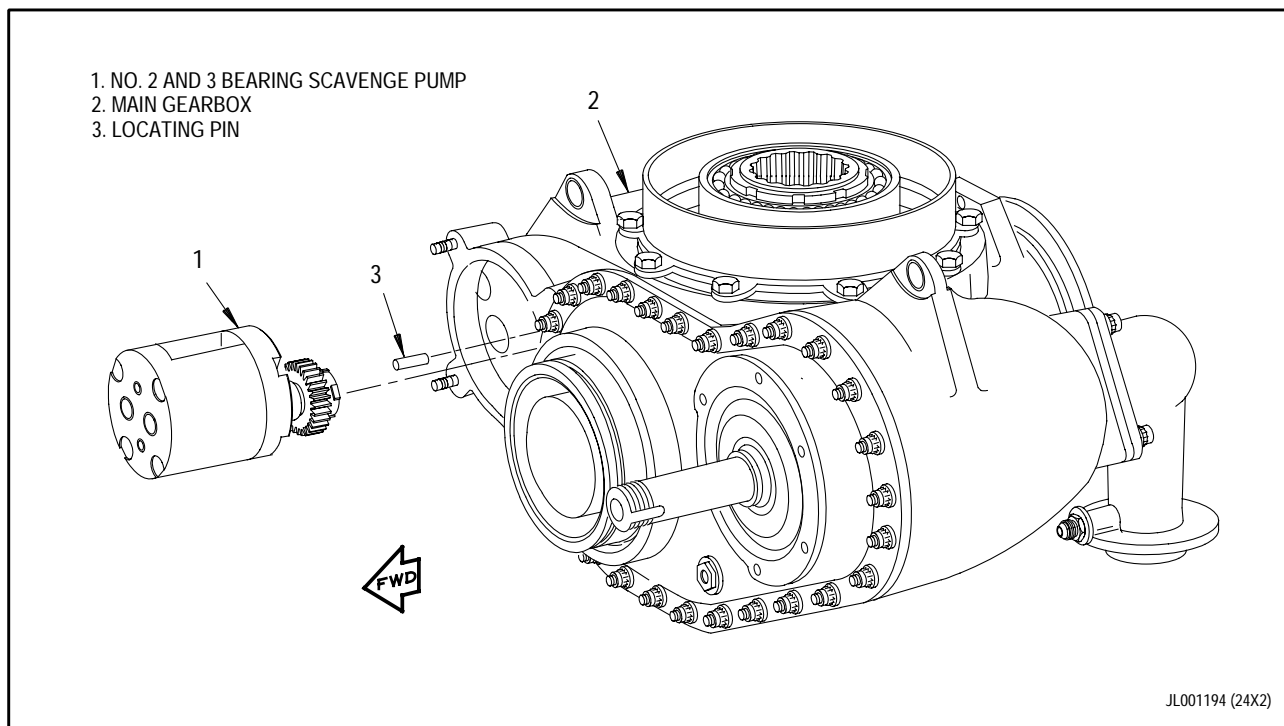
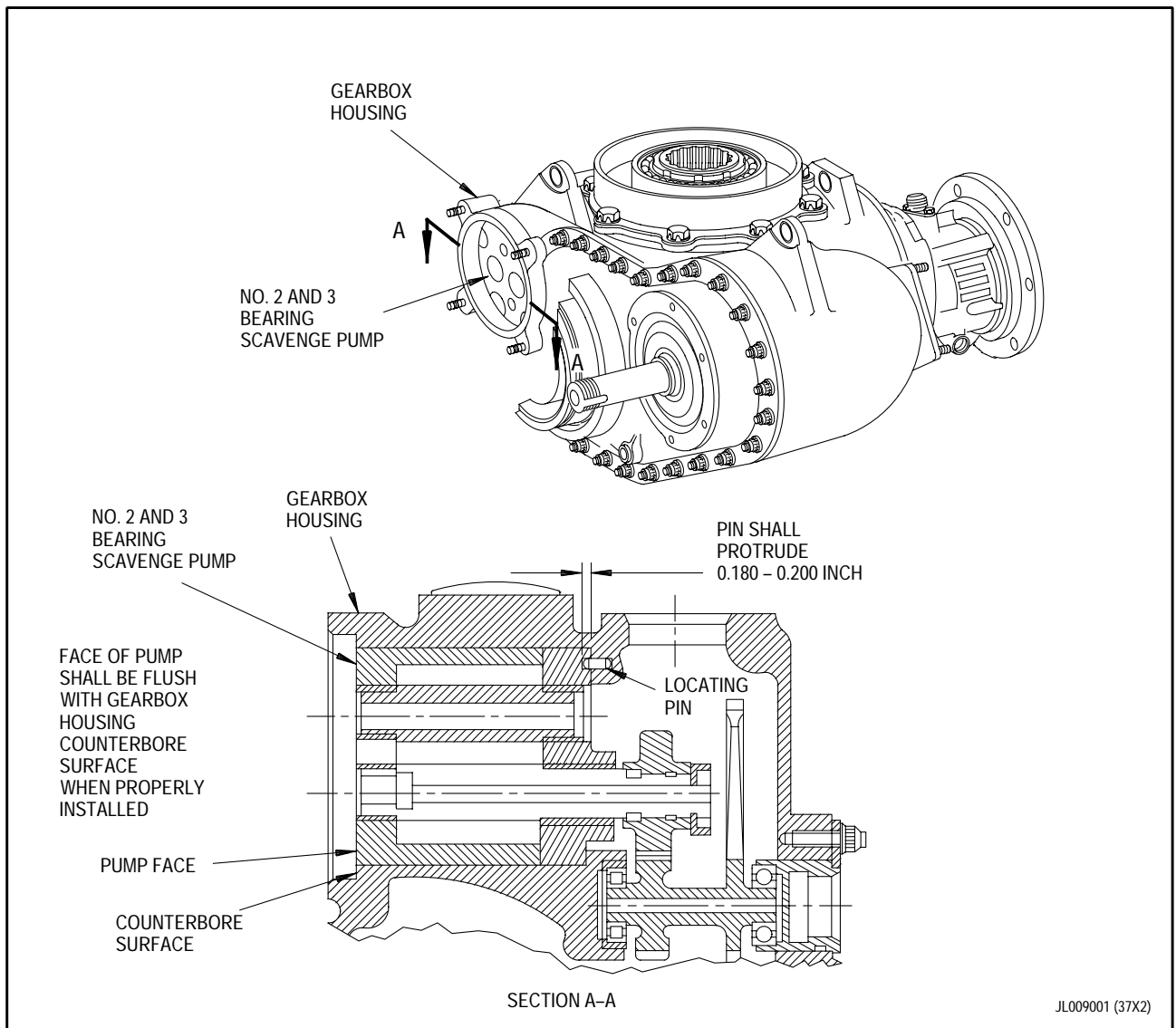


Figure 2. No. 2 and 3 Bearing (Gearbox) Scavenge Pump - Installation

b. Check condition of locating pin(3) for pump in gearbox(2) prior to installing pump. Pin shall protrude 0.180 to 0.200 inch from housing surface (figure 3).

c. With drivegear at 5-6 o'clock position, install into cavity.



**Figure 3. No. 2 and 3 Bearing Scavenge Pump Installation Inspection**



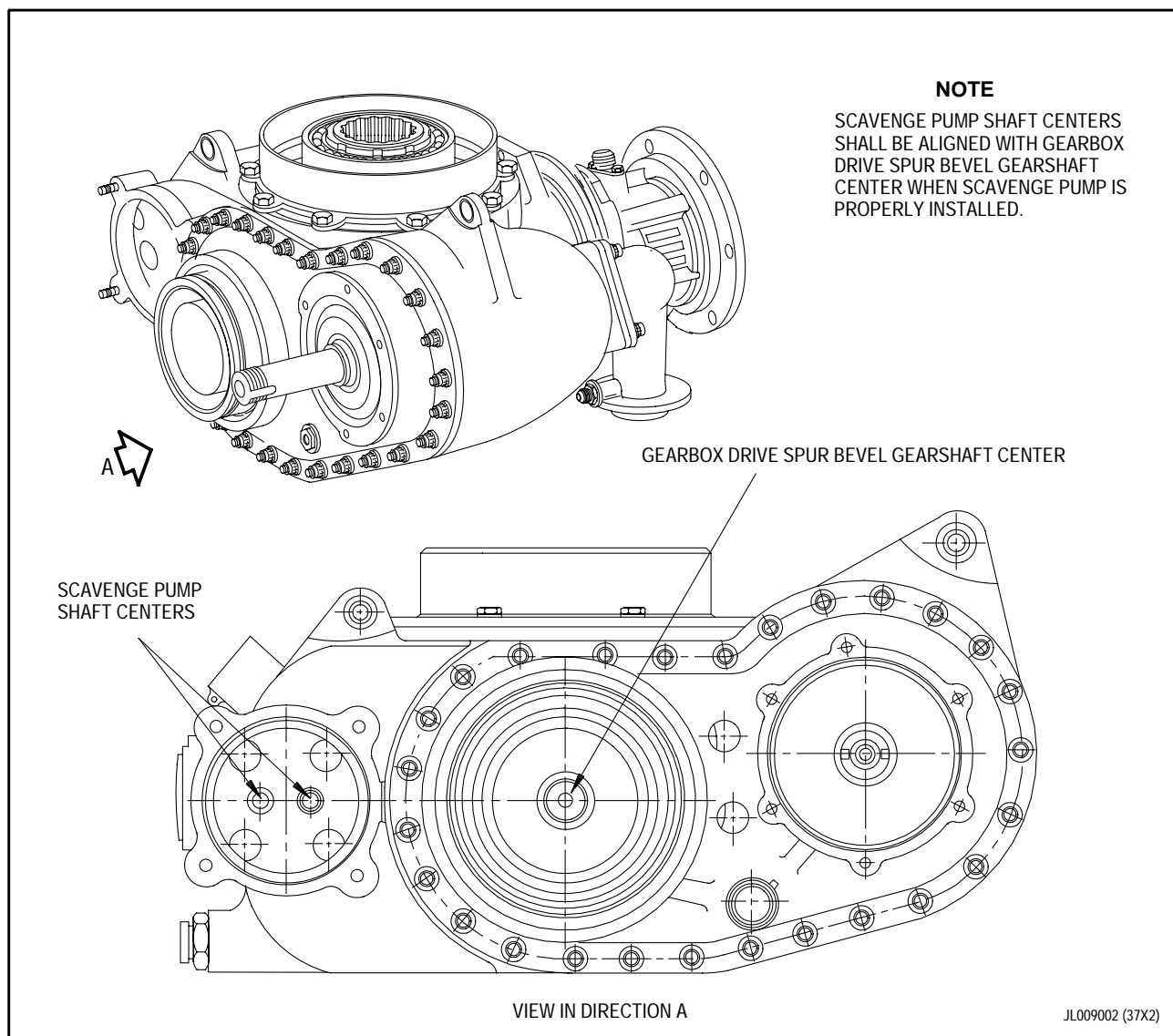
An improperly installed scavenge pump may cause oil starvation to the bearings.

**NOTE**

- PWA 50433 holder inserted into starter drive end of gearbox drive spur bevel gearshaft may be used to rotate gearbox gears in order to mesh oil pump drive idler gear and scavenge pump drivegear.
  - Directional references are from the front.
- d. When gear clears housing wall, twist pump 1/4 of full turn

counterclockwise. Locate scavenge pump on pin in gearbox housing. Seat pump. Pump is properly seated when end of scavenge pump is flush with counterbore of gearbox housing and main oil pump gearshaft holes are aligned parallel with the gearbox drive spur bevel gearshaft centerline (figure 4).

- e. To ensure correct gear engagement, rotate gearbox drive spur bevel gearshaft and observe that splined pump shaft also rotates.



**Figure 4. No. 2 and 3 Bearing Scavenge Pump Shaft Centers Alignment**



#### 4. OIL TANK SCAVENGE TUBE CONNECTOR - INSTALLATION.

(See Figure 5.)

- a. Install locknut(3, figure 5) recessed end out, to inner thread of double threaded end of connector.
- b. Install retainer(2) into recess of nut.
- c. Install packing(1) in recess between threaded portions of connector(4).
- d. Turn nut until packing firmly contacts first outer thread of connector(4).

- e. Install assembled connector(4) to angled threaded boss keeping nut turning until packing makes contact. (This can be determined by a sudden increase in torque.)

#### NOTE

Locknut will be torqued and lockwired after oil tube which attaches to main oil pump is installed.

- f. Hold nut from turning, if possible, and turn connector(4) 1 1/2 turns, then turn connector in (not more than one turn) to have outer end of connector pointing foreward. (See figure 5.)

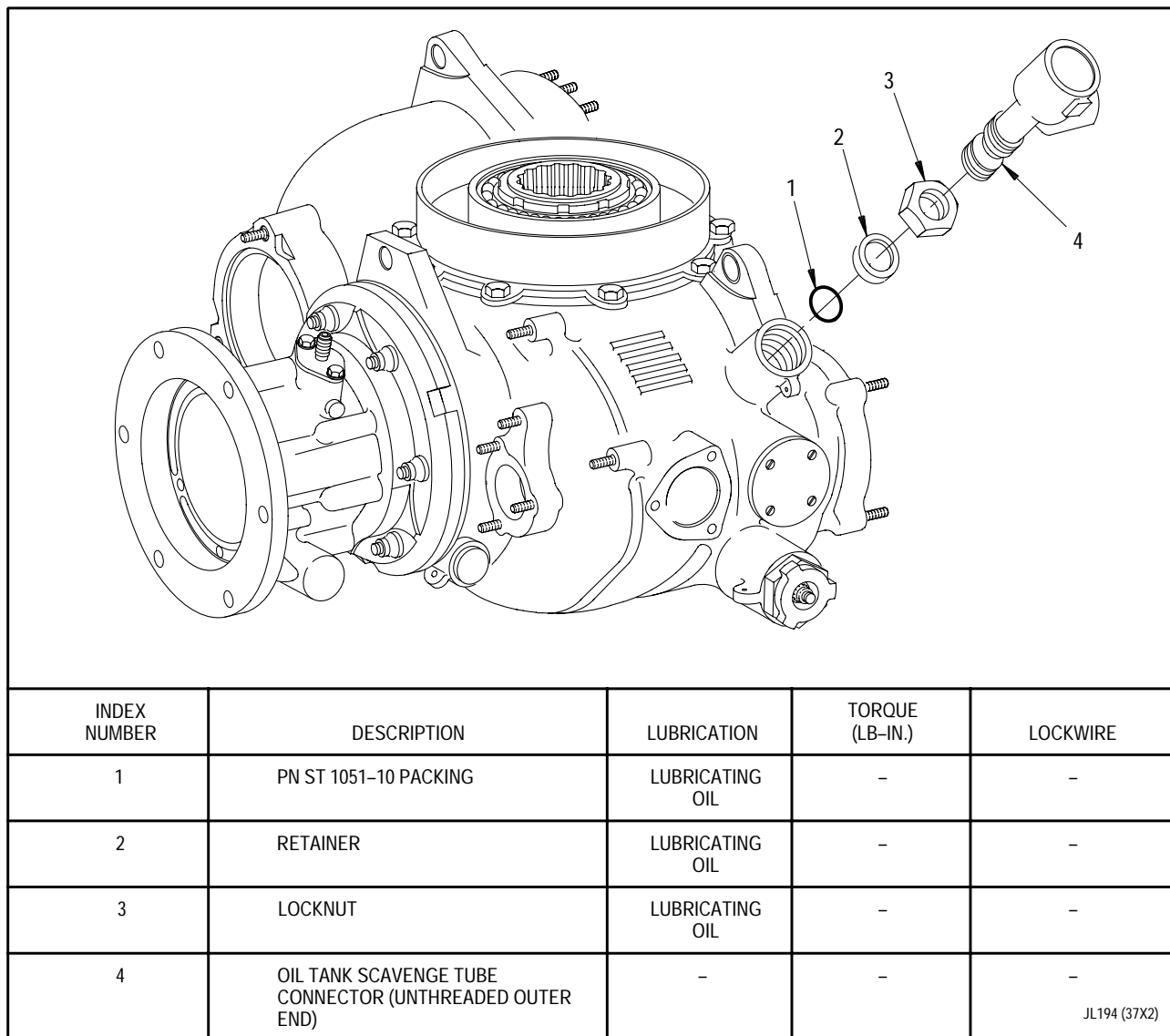


Figure 5. Oil Tank Scavenge Tube Connector - Installation



**5. MAIN OIL PUMP - INSTALLATION.**

(See Figures 6 and 7.)

- a. Coat packing(14, figure 6) with MIL-L-7808 lubricating oil.
- b. Install packing(14) in packing groove of main oil pump(5).
- c. Check main oil pump gear rotation as follows:

**NOTE**

Mating splined driveshaft taken from No. 2 and 3 bearing scavenge pump may be used to turn main oil pump gears.

- (1) Install PWA 55419 adapter and torque screw driver on spline of main oil pump.
- (2) Turn main oil pump gears with shaft. Gears shall turn freely with maximum of 2 pound-inches torque. Replace main oil pump if gears bind or grind. Remove shaft. Check main oil pump gear splines for damage.

- d. Visually inspect No. 2 and 3 bearing scavenge pump to ensure pump is properly installed in main gearbox.
- e. Visually inspect main oil pump(5) to ensure main oil pump stack is properly indexed in pump housing. (See figure 7.)
- f. Install main oil pump(5, figure 6) into gearbox housing(15), aligning splines of main oil pump with splines of scavenge pump. Rotate gearbox drive spur bevel gearshaft to align splines. Align holes in main oil pump with dowel pins in scavenge pump. If applicable, insert tube(2) into connector(17).

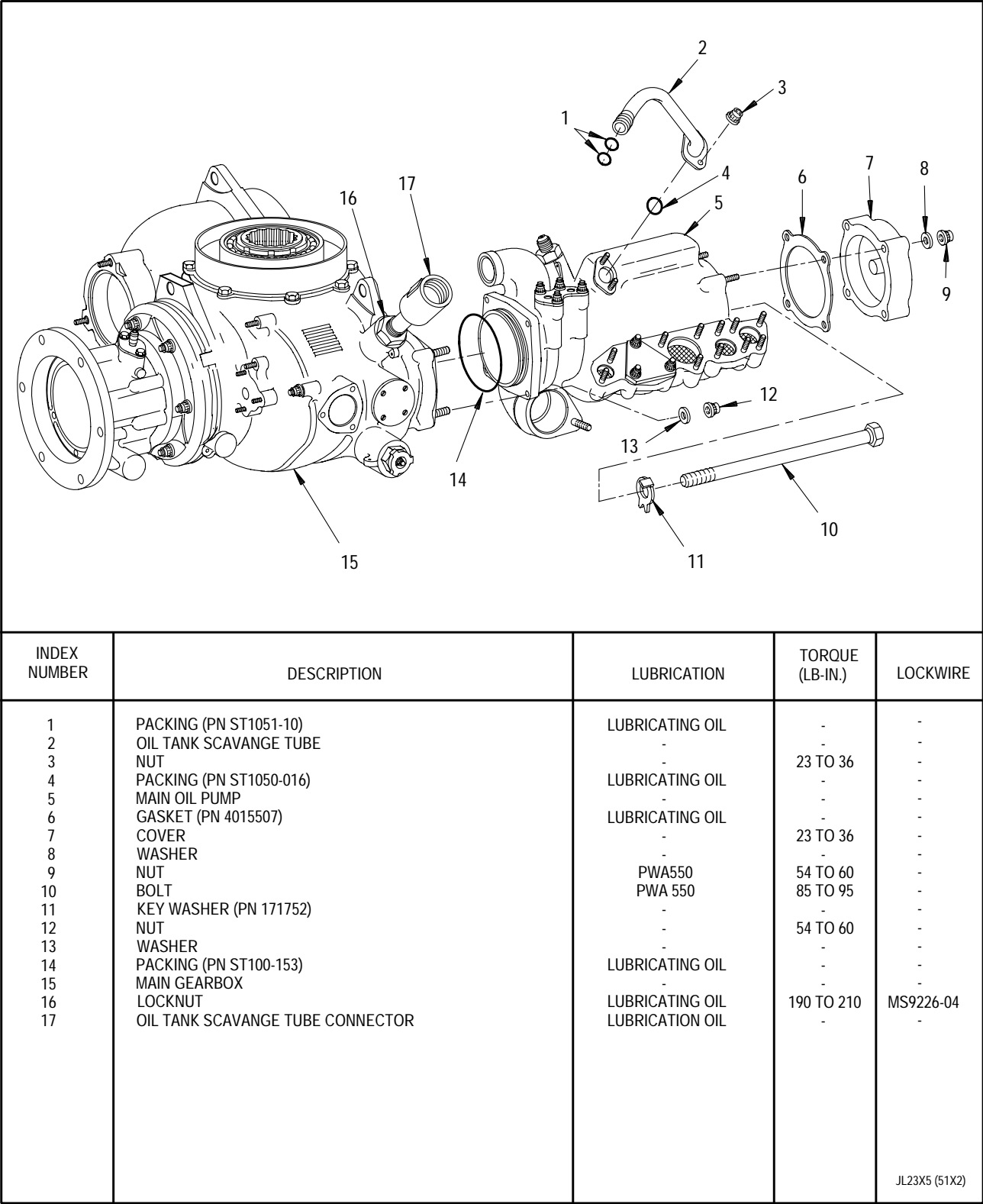
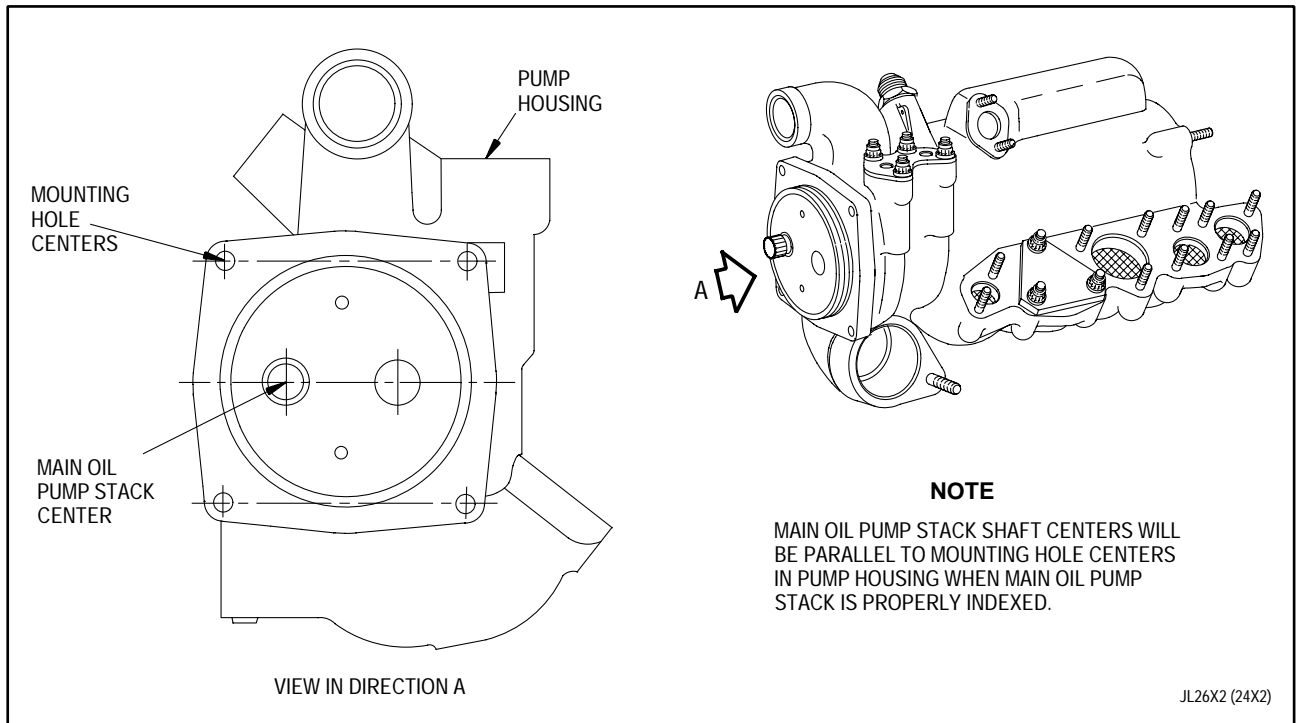


Figure 6. Main Oil Pump - Installation



**Figure 7. Main Oil Pump Shaft Stack Indexing**

g. Install oil tank scavenge tube(2) as follows:

- (1) Coat two packings(1) and packing(4) with MIL-L-7808 lubricating oil.
- (2) Install packings(1 and 4) on tube(2). Packing(4) is installed on flange end of tube.
- (3) Install tube(2) onto main oil pump(5) and connector(17).
- (4) Secure with nuts(3) fingertight.

h. Secure front flange of main oil pump(5) to gearbox housing(15) with nuts(12) and washers(13). Torque nuts 54 to 60 pound-inches.

i. Install key washers(11) to outer end of main oil pump with prebent tang in locking hole. Install bolts(10) through end of main oil pump into No. 2 and 3 bearing scavenge pump in gearbox. Torque bolts 85 to 95 pound-inches. Ensure prebent tab of key washer is still installed in holes. Bend tabs of key washers against bolthead with one tab against bolthead flat. Maximum gap between tab and bolt is 0.020 inch.

j. Install lubricated gasket(6) and cover(7) on studs on end of main oil pump(5). Secure with washers(8) and nuts(9). Torque nuts 54 to 60 pound-inches.

k. Secure tube(2), as follows:

(1) Ensure tube(2) is fully seated in connector(17).

(2) Torque nuts(3) 23 to 36 pound-inches.

(3) Torque locknut(16) 190 to 210 pound-inches. Lockwire locknut using PN MS9226-04 wire.

## **6. OIL FILTER - INSTALLATION.**

(See Figure 8.)

### **NOTE**

There are two configurations of oil filter assemblies. A 70 micron filter that has a cleanable element or a 30 micron filter that has a disposable filter element and bypass valve with an actual bypass indicator located in the filter bowl bottom. Install 70 micron filter per step a. Install 30 micron filter per step b.

a. Install 70 micron filter as follows:

(1) Coat PN M83248-1-023 packing(5, figure 8) and PN M83248-1-144 packing(7) with MIL-L-7808 oil or VV-P-236 petrolatum.

(2) Install packing(7) in groove of oil filter bowl(8). Install packing(5) to top of filter element(6).

(3) Install filter element(6) into oil filter bowl(8) and install bowl into oil filter head(4).

(4) Coat two PN ST1000-214 packings(2) with MIL-L-7808 lubricating oil or VV-P-236 petrolatum.

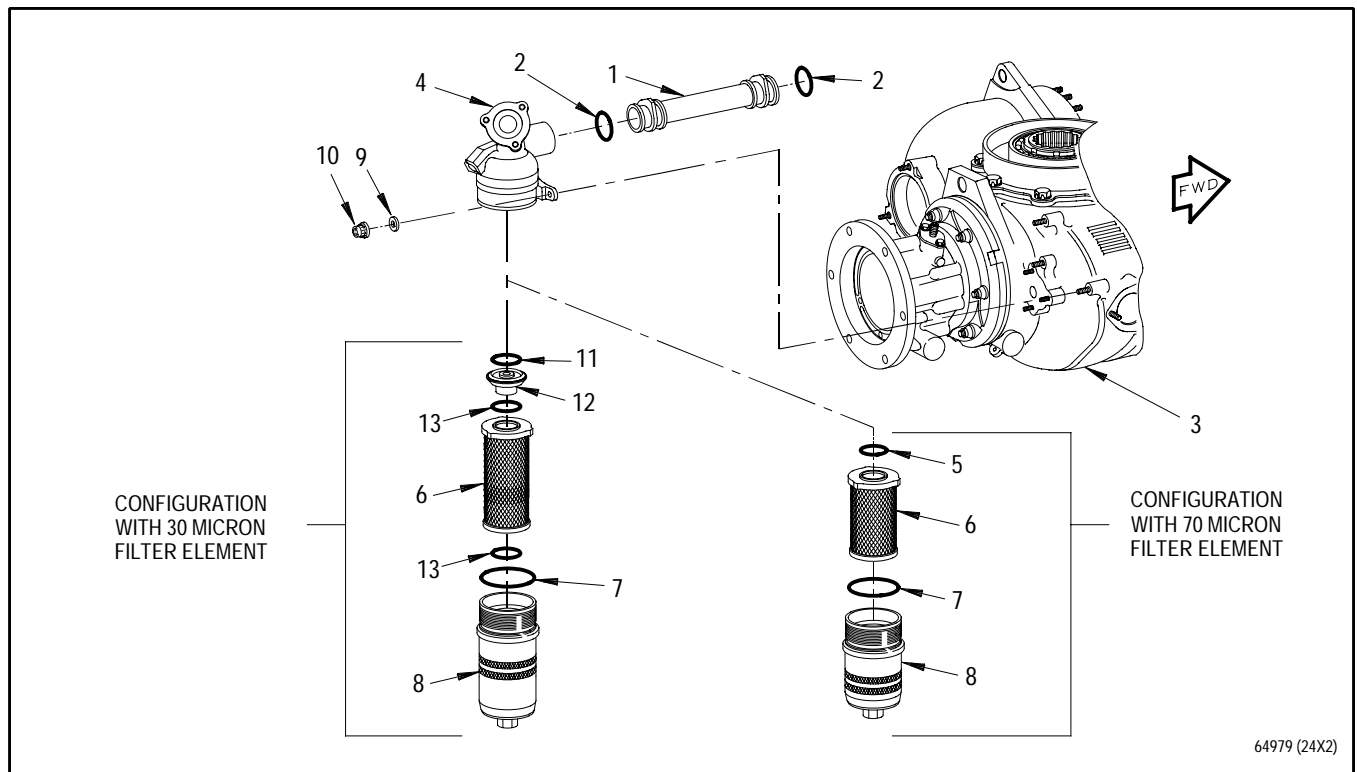
(5) Install packings(2) on main oil pump to oil filter transfer tube(1).

(6) Install tube into port of main oil pump.

(7) Position oil filter head(4) on gearbox module(3) so studs pass through mounting holes and transfer tube(1) seats into oil filter head(4).

(8) Install washer(9) and nuts(10). Torque nuts 54 to 60 pound-inches.

(9) Tighten oil filter bowl(8) to obtain 0.000 to 0.030 inch clearance with mating shoulder of oil filter head(4). Do not exceed 300 pound-inches torque when tightening filter bowl to filter head. Lockwire bowl to filter head using PN MS 9226-04 wire.



Index No.	Description	Lubrication	Torque (lb-in.)	Lockwire
1.	Transfer tube	-	-	-
2.	Packings	MIL-L-7808 oil or VV-P-236 petrolatum	-	-
3.	Gearbox module	-	-	-
4.	Oil filter head	-	-	-
5.	Packing	MIL-L-7808 oil or VV-P-236 petrolatum	-	-
6.	Filter element	-	-	-
7.	Packing	MIL-L-7808 oil or VV-P-236 petrolatum	-	-
8.	Oil filter bowl	-	-	MS9226-04
9.	Washer	-	-	-
10.	Nuts	PWA 550	54 to 60	-
11.	Packing	MIL-L-7808 oil or VV-P-236 petrolatum	-	-
12.	Element bypass valve assembly	MIL-L-7808 oil or VV-P-236 petrolatum	-	-
13.	Packings	MIL-L-7808 oil or VV-P-236 petrolatum	-	-

Figure 8. Oil Filter - Installation

b. Install 30 micron oil filter as follows:

- (1) Coat PN M83248/1-144 packing(7), and three PN M83248/1-023 packings(11 and 13) with MIL-L-7808 oil or VV-P-236 petrolatum.
- (2) Install packing(7) in groove of oil filter bowl(8). Install packing(11) in groove of bypass valve(12). Install packings(13) into filter element(6).
- (2a) Install bypass valve(12) into oil filter head(4).
- (3) Install filter element(6) into oil filter bowl(8) and install bowl into oil filter head(4).
- (4) Coat two PN ST1000-214 packings(2) with MIL-L-7808 lubricating oil or VV-P-236 petrolatum.
- (5) Install packings(2) on main oil pump to oil filter transfer tube(1).
- (6) Install tube into port of main oil pump.
- (7) Position oil filter head(4) on gearbox module(3) so studs pass through mounting holes and transfer tube(1) seats into oil filter head(4).

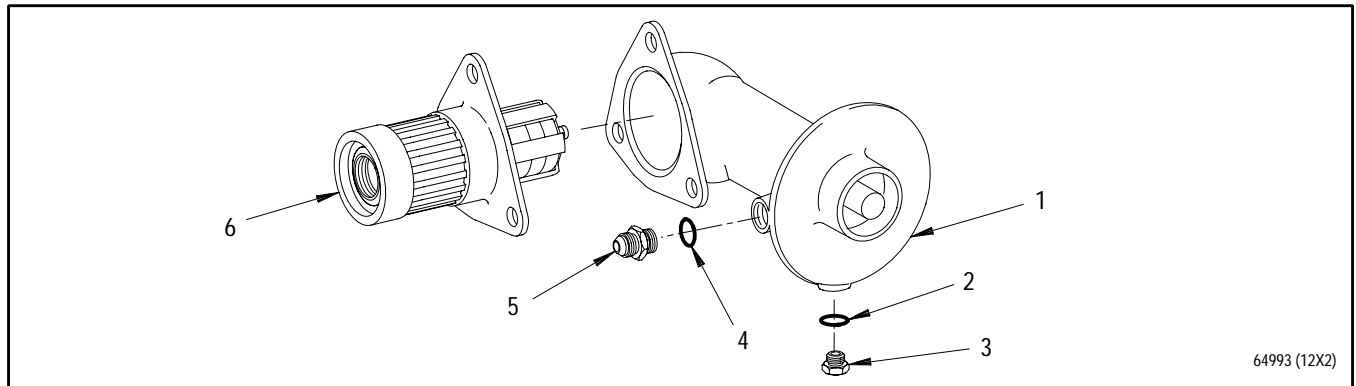
(8) Install washer(9) and nuts(10). Torque nuts 54 to 60 pound-inches.

(9) Tighten oil filter bowl(8) to obtain 0.000 to 0.030 inch clearance with mating shoulder of oil filter head(4). Do not exceed 300 pound-inches torque when tightening filter bowl to filter head. Lockwire bowl to filter head using PN MS9226-04 wire.

## **7. BREATHER PRESSURIZING VALVE ASSEMBLY - INSTALLATION OF ATTACHING PARTS.**

(See Figure 9.)

- a. Coat two PN ST1001-04 packings(2 and 4) with MIL-L-7808 oil or VV-P-236 petrolatum. Install packings(2 and 4) on adapter(5) and plug(3).
- b. Remove protective caps from breather pressurizing valve housing(1). Lubricate threads of adapter(5) and plug(3) with MIL-L-7808 oil or VV-P-236 petrolatum.
- c. Install adapter(5) and plug(3) into ports of valve housing(1) and torque 65 to 75 pound-inches. Lockwire plug(3) using PN MS9226-04 wire.



1. Breather pressurizing valve housing
2. Packing
3. Plug
4. Packing
5. Tube adapter
6. Breather pressurizing valve

**Figure 9. Breather Pressurizing Valve Assembly - Installation of Attaching Parts**

## **8. BREATHER PRESSURIZING VALVE ASSEMBLY - INSTALLATION.**

(See Figure 10.)

- a. Install breather pressurizing valve(2, figure 10) as follows:

- (1) Coat packing(1) with MIL-L-7808 oil or VV-P-236 petrolatum. Install packing(1) in groove of mating flange between gearbox and valve(2).

- (2) Coat threads of mounting studs on gearbox with PWA 36545 antigalling compound.

- (3) Remove protective cover from gearbox. Install valve(2) into gearbox, aligning valve flange over gearbox studs.

- (4) Apply an even, continuous coat of PWA 36000-2 or PWA 36000-3 sealing compound to flange face of breather pressurizing valve housing(3). Wait 10 minutes before installing valve housing(3).

- (5) Place valve housing(3) over gearbox studs and valve(2).

- (6) Install washer(4) on stud. Install nuts(5) and torque 45 to 60 pound-inches. Wait 10 minutes; torque nuts 45 to 60 pound-inches.

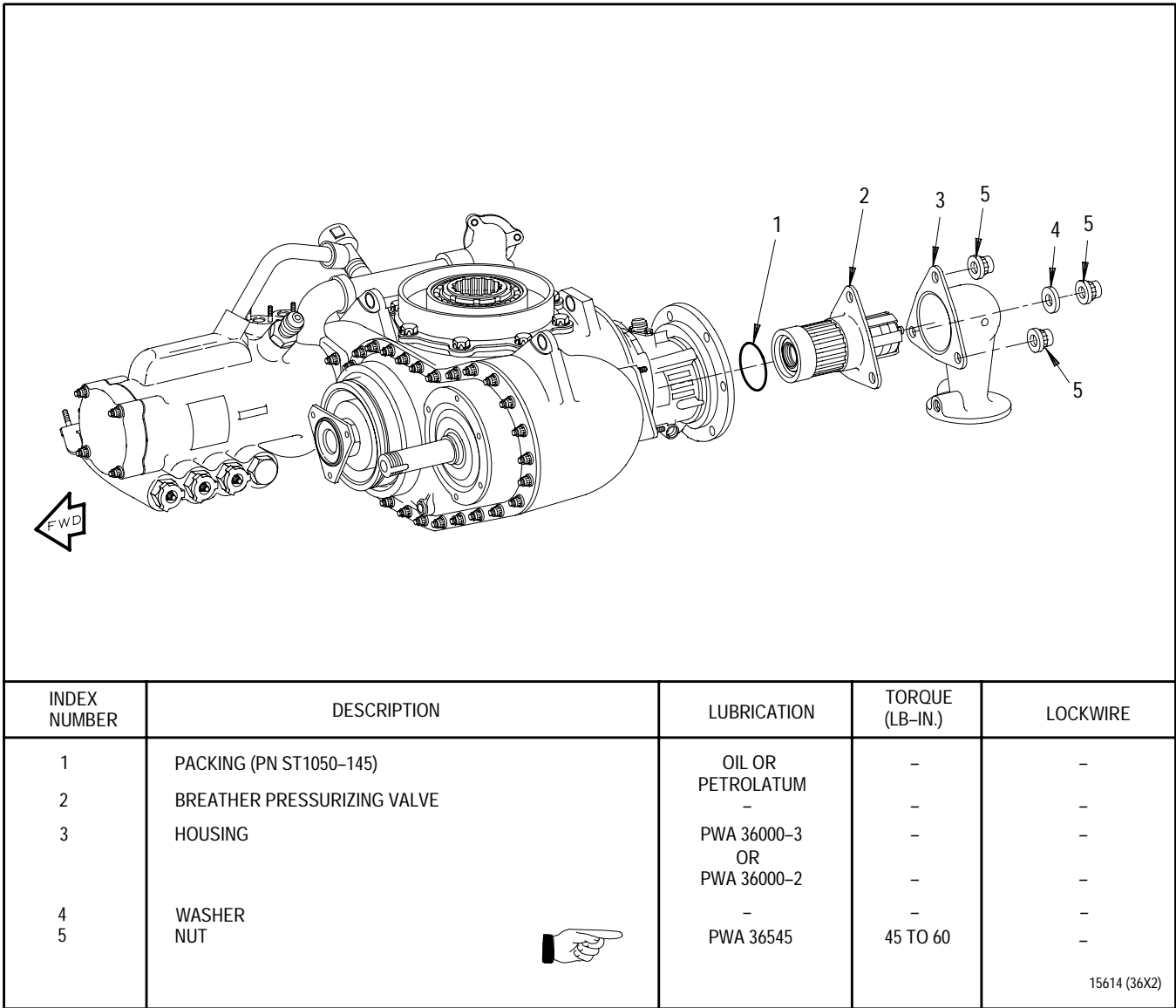


Figure 10. Breather Pressurizing Valve Assembly - Installation



## 9. REMOTE GEARBOX DRIVESHAFT COUPLING - ALIGNMENT AND INSTALLATION.

(See Figures 11 and 12 and Table 1.)

### NOTE

This procedure provides a step-by-step method to achieve an alignment with a minimum to maximum runout of 0.006 inch or less. If the coupling cannot be aligned within this limit, return it to stock and install another serviceable coupling. All minimum to maximum measurements should be rounded off to three decimal places.

a. Measure minimum to maximum runout in three places as follows:

- (1) Use clean lint-free cloth moistened with isopropyl alcohol and clean alignment ring surface of driveshaft coupling. (See figure 11.)
- (2) Remove two nuts and washers from front gearbox housing cover and install PWA 55712 indicator on two studs. Tighten nuts to secure indicator.
- (3) Use Colorbrite No. 2101 marking crayon and mark bolt holes number 1, 2, and 3 on driveshaft coupling triangular flange. (See figure 11.)

- (4) Lubricate spline of driveshaft coupling with MIL-L-7808 oil. Install coupling in gearbox drive spur bevel gearshaft with bolt hole number 1 aligned with anti-rotation slot at 6 o'clock position. (See figure 11.)
- (5) Apply PWA 550 antigalling compound to threads of bolt(1, figure 12) and washer face of bolthead.
- (6) Install bearing(3), spacer(4), and key washer(2) into bore of coupling(5).
- (7) Install bolt(1) and torque 420 to 445 pound-inches using PWA 57388 or SAALC X8869968 torque adapter.
- (8) Align PWA 55712 indicator on OD of alignment ring (Diameter J) and set indicator to zero. (See figure 11.)
- (9) Rotate driveshaft coupling 360 degrees. Stop exactly at 6 o'clock starting position. If maximum to minimum runout is 0.003 inch or less, do steps (10), (11), and (12). If runout exceeds 0.003 inch, record runout and go to step (13).

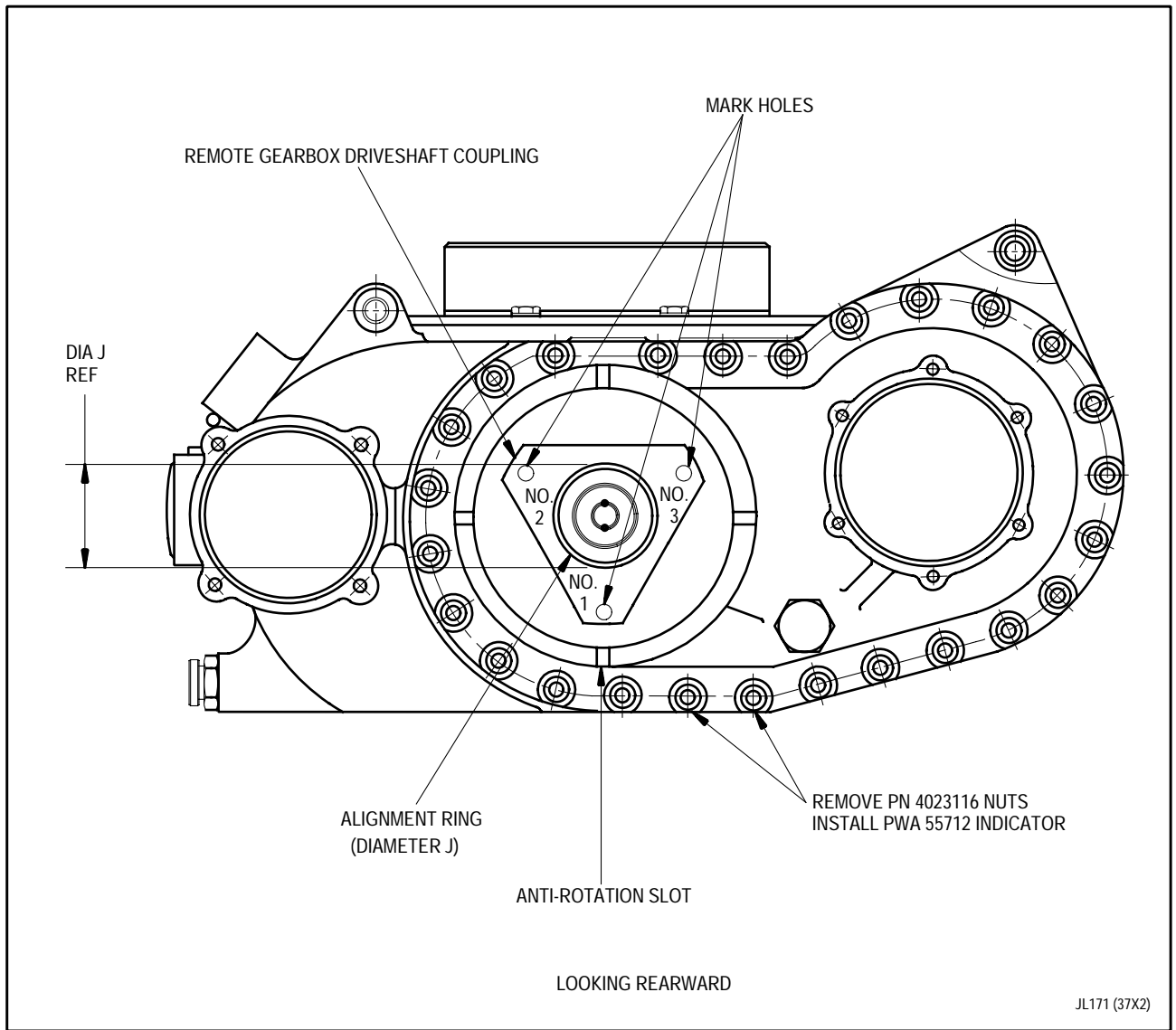
- (10) Bend edge of key washer(2, figure 12) into slots of bolt(1) using standard punch.
- (11) Remove PWA 55712 indicator from gearbox housing front cover.
- (12) Install two PN MS9321-10 washers and PN 4023116 nuts on studs and torque 54 to 60 pound-inches.
- (13) Loosen bolt(1) using PWA 57388 or SAALC X8869968 torque adapter. Remove bolt.



Ensure gearbox drive spur bevel gearshaft does not rotate when positioning coupling to align next bolt hole with anti-rotation slot.

- (14) Align bolt hole No. 1 with anti-rotation slot.

- (15) Remove coupling(5) with spacer(4), bearing(3), and key washer(2) assembled. Install coupling so bolt hole number 2 aligns with anti-rotation slot at 6 o'clock position.
- (16) Install bolt(1) and torque 420 to 445 pound-inches using PWA 57388 or SAALC X8869968 torque adapter
- (17) Align PWA 55712 indicator on OD of alignment ring (Diameter J) and set indicator to zero. (See figure 11.)
- (18) Using wrench, rotate driveshaft coupling 360 degrees. Stop exactly at 6 o'clock starting position. If maximum to minimum runout is 0.003 inch or less, do steps (18), (19), and (20). If runout exceeds 0.003 inch, record runout and go to step (21).



JL171 (37X2)

**Figure 11. Remote Gearbox Driveshaft Coupling - Alignment**

- (19) Bend edge of key washer(2, figure 12) into slots of bolt(1) using standard punch.
- (20) Remove PWA 55712 indicator from gearbox housing front cover.
- (21) Install two PN MS9321-10 washers and PN 4023116 nuts on studs and torque 54 to 60 pound-inches.
- (22) Loosen bolt(1) using PWA 57388 or SAALC X8869968 torque adapter. Remove bolt.



Ensure gearbox drive spur bevel gearshaft does not rotate when positioning coupling to align next bolt hole with anti-rotation slot.

- (23) Align bolt hole No. 1 with anti-rotation slot.
- (24) Remove coupling(5) with spacer(4), bearing(3), and key washer(2) assembled. Install coupling so bolt hole number 3 aligns with anti-rotation slot at 6 o'clock position.
- (25) Install bolt(1) and torque 420 to 445 pound-inches using PWA 57388 or SAALC X8869968 torque adapter.
- (26) Align PWA 55712 indicator on OD of alignment ring (Diameter J) and set indicator to zero. (See figure 11.)
- (27) Using wrench, rotate driveshaft coupling 360 degrees. Stop exactly at 6 o'clock starting position. If maximum to minimum runout is 0.003 inch or less, do steps (26), (27), and (28). If runout exceeds 0.003 inch, record runout and go to step b.
- (28) Bend edge of key washer(2, figure 12) into slots of bolt(1) using standard punch.
- (29) Remove PWA 55712 indicator from gearbox housing front cover.
- (30) Install two PN MS9321-10 washers and PN 4023116 nuts on studs and torque 54 to 60 pound-inches.

- b. Position driveshaft coupling after completing all three minimum to maximum runout measurements, as follows:

### NOTE

The number 3 bolt hole should be at 6 o'clock spline position.

- (1) Compare three minimum to maximum runout measurements as follows:
  - (a) If all three measurements are greater than 0.006 inch, replace coupling and repeat alignment procedure.
  - (b) If all three measurements are equal and within 0.006 inch or less, coupling may be installed in any spline position.
  - (c) If two measurements are equal and higher than third, install coupling so bolt hole with lowest measurement is in 6 o'clock position.
  - (d) If two measurements are equal and lower than the third, install driveshaft coupling so spline midway point is between two bolt holes at 6 o'clock position. Check runout. If runout is greater than 0.006 inch, return coupling to stock.

- (e) If all three runout readings are unequal, install coupling proportionately between two bolt holes with lowest reading as follows:

1 To calculate best position, make the lowest reading equal A, next higher reading equal B, and highest reading equal C. Install driveshaft coupling at nearest proportional spline position from A toward B.

Example: Let A = 0.005,  
B = 0.006 and C = 0.007

$$\frac{1}{2} \frac{(C-B)}{(C-A)} = \frac{0.001}{2(0.002)} = 0.2500$$

From table 1, place coupling two spline positions from location of reading A toward location of reading B.

2 Check runout. If all three measurements are greater than 0.006 inch, replace driveshaft coupling and repeat alignment procedure. If driveshaft coupling is serviceable, go to next step.

**Table 1. Calculated Values to Find Number of Splines from Readings A to B****NOTE**

To find the number of splines from reading A towards reading B use the calculated value below

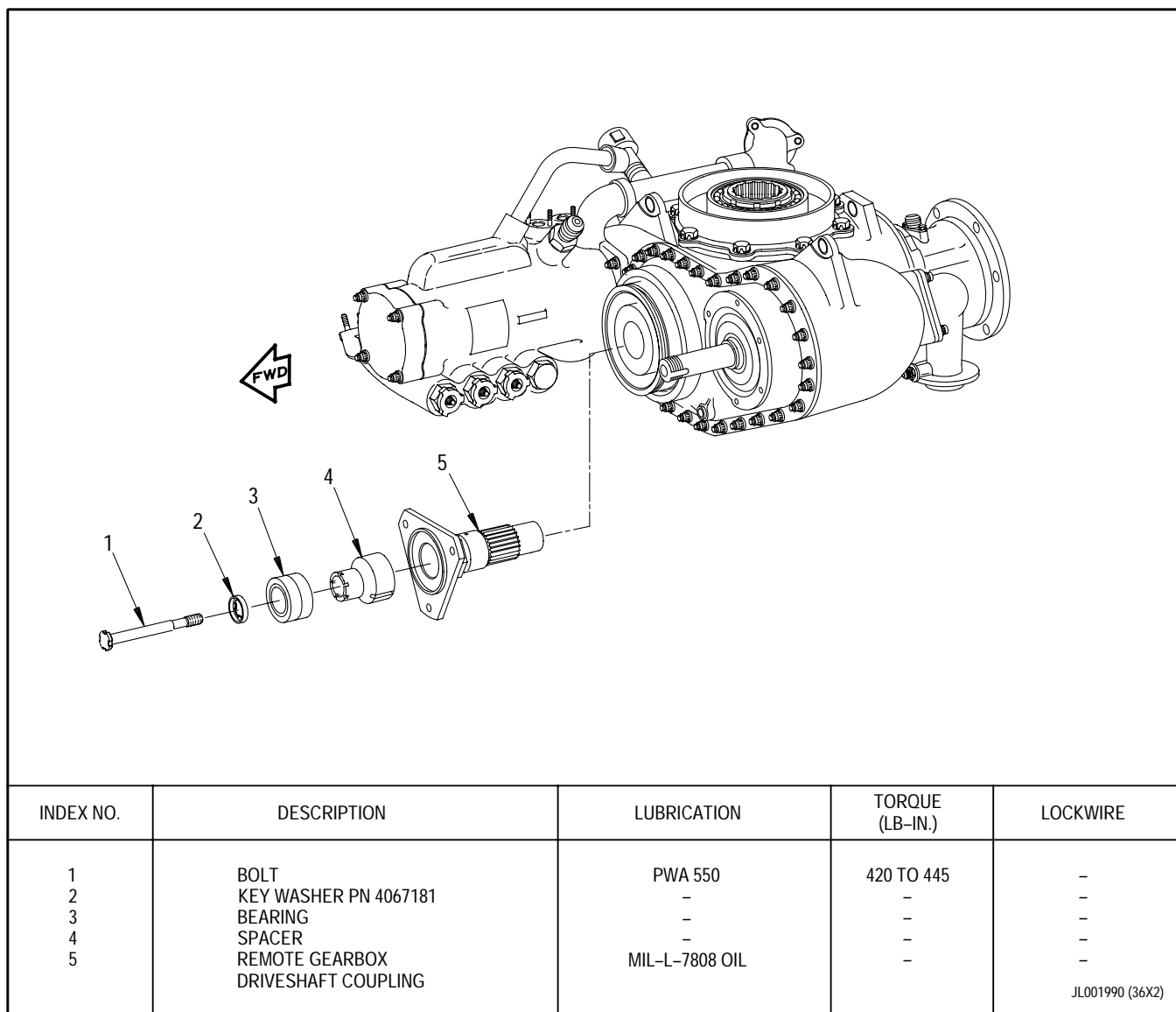
<b>No. of Splines From A to B</b>	<b>Calculated Value From Readings</b>		
0	0	to	.0624
1	.0625	to	.1874
2	.1875	to	.3124
3	.3125	to	.4374
4	.4375	to	.5624
5	.5625	to	.6874
6	.6875	to	.8124
7	.8125	to	.9374
8	.9375	to	1.0

- (2) Bend edge of key washer(2) into slots of bolt(1) using standard punch.

- (3) Remove PWA 55712 indicator from gearbox housing front cover.

- (4) Install two PN MS9321-10 washers and PN 4023116 nuts on studs and torque 54 to 60 pound-inches.

- c. If three driveshaft couplings are aligned on the same gearbox and none meets the 0.006 inch or less runout, replace gearbox module.
- d. After alignment has been achieved (maximum runout is 0.006 inch or less), reference mark the remote gearbox driveshaft coupling to the gearbox front cover. Use Colorbrite No. 2101 marking crayon.



**Figure 12. Remote Gearbox Driveshaft Coupling - Installation**

**10. GEARBOX MODULE - REMOVAL FROM BUILD STAND.**



**NOTE**

Secure PWA 56579 handling fixture per step a., or PWA 57071 handling fixture per step b. onto gearbox.

- a. Attach PWA 56579 handling fixture as follows:
  - (1) Remove support clamp from PWA 56579 fixture prior to installation.
  - (2) Position the two retainer lugs over the two nuts securing reduction gearbox assembly to main gearbox housing. Tilt fixture slightly to slip over nuts.
  - (3) Install opposite end of tool into PTO housing groove. Reinstall support clamp and secure hand knobs.
  - (4) Adjust trunion arms as required to optimize center of gravity.
- b. Attach PWA 57071 handling fixture as follows:
  - (1) Align fixture bracket holes with reduction gearbox drive pad nuts. Attach fixture support clamp to main gearbox at grooved boss of starter drive pad. Secure with two hand knobs.
  - (2) Attach separable overhead handling arm to fixture by sliding arm on fixture pivot journal and securing with ball lock pin. Attach hoist to handling arm.
- c. Take up slack in sling with hoist.

If not properly balanced and supported, module may swing when released from build stand. Steady module as it is released from build stand to prevent possible damage.

- d. Carefully remove ball lock pins holding module to adapter mounted on build stand while manually supporting fixture.
- e. Manually rotate module and, either place in suitable container or if gearbox is to be installed on engine, connect fixture to PWA 24667 jack mating bracket on fixture with platform of jack. Secure with ball lock pin of jack.
- f. Allow weight of module to be accepted by jack or container and remove sling. In case of container, handling fixture may be removed if desired.
- g. Cover fuel pump pad.



# WORK PACKAGE

## INTRODUCTION

## GEARBOX MODULE -

## TABLE OF LIMITS AND CLEARANCE CHARTS

## EFFECTIVITY: ENGINE MODEL F100-PW-229

### LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2					0

**1. INTRODUCTION.**

- a. This work package introduces the 800 00 and up series of work packages for gearbox module. The following work packages are included in this series.

<b>WP/SWP No.</b>	<b>Title</b>
801 00	Gearbox Module - Table of Limits and Clearance Charts
802 00 and up	Open

**WORK PACKAGE****TECHNICAL PROCEDURES****GEARBOX MODULE - TABLE OF LIMITS AND CLEARANCE CHARTS****EFFECTIVITY: ENGINE MODEL F100-PW-229****LIST OF EFFECTIVE WP PAGES**

Total Number of Pages in this WP is 20

<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>	<b>PAGE NO.</b>	<b>CHANGE NO.</b>
1 . . . . .	20	14 . . . . .	0	16 - 18 . . . . .	0
2 - 12 . . . . .	0	15 . . . . .	20	19 . . . . .	2
13 . . . . .	1			20 Blank . . . . .	0

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - -	T.O. 2J-1-111

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

## 1. INTRODUCTION.

- a. This work package contains dimensional limits and clearnace charts for gearbox module.

## 2. GENERAL INSTRUCTIONS.

(See FO-1, and Tables 1 through 4.)

- a. The gearbox module dimensional limits and torque values are contained in four tables: Table 1 consists of fits and clearances between mating modular parts which require control, Table 2 provides instructions for all special torque procedures; Table 3 provides spring load limits, and Table 4 provides mounting distance and backlash.
- b. Each entry has a reference number which corresponds to a similar number of FO-1 Gearbox Module Dimensional Limits and Torque Values. The illustration is used for part identification and to indicate where in the module the referenced limit or torque value applies.

### NOTE

When the DIR column is blank, it means the fit is used only for manufacturing purposes and is not required for assembly.

- c. Heading DIR depot inspection requirements, indicated frequency and manner of inspection for adjacent reference number. Letters A, B, C, D, E, and F are used to designate inspection requirements as follows:

- A Measurements required, probably performed at assembly or bench assembly.
- B Clearances that are estimated either by trial assembly or similar means at each depot repair. Measurements are required when feel or appearance indicates looseness or tightness which is outside specified tolerance. Measurements shall be taken if either of parts involved is replaced at depot and parts shall be selected to fit within tolerance specified.
- C Estimated clearance checked at assembly during each depot repair. Measure suspected deviations as stated in Category B.

D Measurements required to provide analytical inspection on first three engines reaching each successive time depot repair. For example, operator with 300 hours depot repair period shall perform this inspection on first three engines to reach 600 hours, 900 hours, and so on. Any inspections which show excessible wear condition shall be changed to Category A.

E Clearances that are not subject to wear or change in normal operation and which shall be estimated during analytic depot inspection. Suspected change of fit requires measurement as in Category B.

F Clearance to be measured only at replacement of parts. Many of these fits will be machine shop measurements.

d. The Minimum or Maximum tolerances in the limits column of Table 1 represents the value obtained by subtracting the minimum or maximum dimensions in the Dimension for Reference column. In most cases these values have an additional tolerance added to either the Minimum or Maximum limit, thus eliminating the Replace If Over Column.

(1) Limits without a single asterisk (\*) or double asterisk (\*\*) appearing in the limits column have a Replace If Over tolerance added to either the Minimum or Maximum limit, or both.

(2) Limits with a single asterisk (\*) appearing in the limits column have no Replace If Over tolerance assigned.

(3) Limits with a double asterisk (\*\*) appearing in either the Minimum or Maximum limits column, or both, have been assigned a Replace If Over clearance limit identical to the respective blueprint clearance limit.

e. For a more detailed explanation of reference numbers, limits, terms, symbols, units, and standard torques, refer to T.O. 2-1-111.

Table 1. Gearbox Module - Fits and Clearances (See FO-1.)

Ref No.	DIR	Name	Dimension for Ref		Limits	
			Min.	Max.	Min.	Max.
5301	B	Ball bearing - - - - -	2.4406	2.4409		
		Gearbox rear housing - - - - -	2.4369	2.4379	.0027T*	.0040T*
5302	B	Gearbox Deaerator				
		impeller shaft - - - - -	1.3781	1.3789		
		Ball bearing - - - - -	1.3778	1.3780	.0001T*	.0011T*
5303	B	Gearbox deaerator				
		impeller shaft - - - - -	1.7295	1.7305		
		Impeller - - - - -	1.7280	1.7290	.0005T*	.0025T*
5304	B	Gearbox deaerator				
		impeller shaft - - - - -	1.6805	1.6815		
		Impeller - - - - -	1.6790	1.6800	.0005T*	.0025T*
5305	B	Gearbox deaerator				
		impeller shaft - - - - -	1.3781	1.3789		
		Spur gear - - - - -	1.3764	1.3776	.0005T*	.0025T*
5306	B	Roller bearing - - - - -	2.4406	2.4409		
		Gearbox front housing - - - - -	2.4369	2.4379	.0027T*	.0040T*
5307	B	Gearbox deaerator				
		impeller shaft - - - - -	1.3781	1.3789		
		Roller bearing - - - - -	1.3778	1.3780	.0001T*	.0011T*
5308	B	Gearbox idler gearshaft - - - - -	1.1630	1.1640		
		Gearbox front housing - - - - -	1.1613	1.1623	.0007T*	.0027T*
5309	A	Spur gear - - - - -	1.8493	1.8501		
		Roller bearing - - - - -	1.8502	1.8504	.0001T*	.0011T*
5310	B	Gearbox idler gearshaft - - - - -	.9844	.9852		
		Roller bearing - - - - -	.9841	.9843	.0001T*	.0011T*
5311	B	Bearing retaining plate - - - - -	2.9712	2.9715		
		Gearbox rear housing - - - - -	2.9690	2.9700	.0012T*	.0025T*

Table 1. Gearbox Module - Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimension for Ref		Limits	
			Min.	Max.	Min.	Max.
5312	A	Gearbox drive spur bevel gearshaft - - - - -	1.5747	1.5754		
		Ball bearing - - - - -	1.5746	1.5748	.0001*	.0008*
5313	B	Gearbox drive spur bevel gearshaft - - - - -	2.4294	2.4301		
		Spur gear - - - - -	2.4280	2.4290	.0004T*	.0021T*
5314	A	Roller bearing - - - - -	3.5430	3.5433		
		Gearbox front housing - - - - -	3.5395	3.5405	.0025T*	.0038T*
5315	B	Gearbox drive spur bevel gearshaft - - - - -	2.1654	2.1660		
		roller bearing - - - - -	2.1651	2.1654	.0000*	.0009T*
5316	B	Ball bearing - - - - -	2.6770	2.6772		
		Bearing retaining plate - - - - -	2.6772	2.6783	.0000*	.0013*
5317	B	Gearbox drive spur bevel gearshaft - - - - -	1.5295	1.5300		
		Gearbox bearing seal seat - - - - -	1.5285	1.5290	.0005T*	.0015T*
5318	A	Sleeve bushing - - - - -	1.2320	1.2325		
		Gearbox rear housing - - - - -	1.2290	1.2300	.0020T*	.0035T*
5319	A	Roller bearing - - - - -	1.1022	1.1024		
		Gearbox rear housing - - - - -	1.1013	1.1018	.0004T*	.0011T*
5320	B	Gearbox spur gearshaft - - - - -	.4725	.4729		
		Roller bearing - - - - -	.4722	.4724	.0001*	.0007T*
5321	B	Ball bearing - - - - -	1.1022	1.1024		
		Gearbox bearing housing - - - - -	1.1024	1.1032	.0000*	.0010*
5322	B	Gearbox spur gearshaft - - - - -	.4725	.4729		
		Ball bearing - - - - -	.4722	.4724	.0001T*	.0007T*
5323	B	Gearbox bearing housing - - - - -	1.2330	1.2335		
		Gearbox rear housing assembly - - -	1.2335	1.2345	.0000*	.0015*



Table 1. Gearbox Module - Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimension for Ref		Limits	
			Min.	Max.	Min.	Max.
5324	B	Roller bearing - - - - -	2.8343	2.8346		
		Gearbox cover - - - - -	2.8346	2.8350	.0000*	.0007*
5325	B	Gearbox bevel gearshaft - - - - -	1.3780	1.3784		
		Roller bearing - - - - -	1.3778	1.3780	.0000*	.0006T*
5326	B	Ball bearing - - - - -	3.9367	3.9370		
		Gearbox sealing sleeve - - - - -	3.9370	3.9374	.0000*	.0007*
5327	B	Gearbox bevel gearshaft - - - - -	2.5598	2.5603		
		Ball bearing - - - - -	2.5589	2.5591	.0007T*	.0014T*
5328	B	Gearbox cover - - - - -	6.2980	6.2990		
		Gearbox rear housing - - - - -	6.2995	6.3015	.0005*	.0035*
5329	B	Gearbox sealing sleeve - - - - -	6.014	6.015		
		Gearbox cover - - - - -	6.015	6.016	.000*	.002*
5331	B	Face seal - - - - -	2.3120	2.3140		
		Gearbox oil seal retainer - - - -	2.3075	2.3085	.0035T*	.0065T*
5332	B	Face seal - - - - -	1.6260	1.6280		
		Gearbox oil seal retainer - - - -	1.6230	1.6240	.0020T*	.0050T*
5333		End Clearance				
		Pump gear - - - - -	1.0895	1.0905		
		Main pump housing - - - - -	1.0925	1.0940	.0020*	.0045*
5334		End Clearance				
		Pump gear - - - - -	.5775	.5785		
		Main pump housing - - - - -	.5805	.5820	.0020*	.0045*
5335		End Clearance				
		Pump gear - - - - -	.8940	.8950		
		Main pump housing - - - - -	.9000	.9010	.005*	.007*

Table 1. Gearbox Module - Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimension for Ref		Limits	
			Min.	Max.	Min	Max
5336		End Clearance				
		Pump gearshaft - - - - -	.6775	.6785		
		Main pump housing - - - - -	.6810	.6820	.0025*	.0045*
5337		End Clearance				
		Pump gear - - - - -	1.3595	1.3605		
		Main pump housing - - - - -	1.3630	1.3640	.0025*	.0045*
5338		Gearbox deaerator				
		impeller shaft spline - - - - -	.0604	.0619		
		Gearbox deaerator				
		impeller spline - - - - -	.0654	.0664	.0035*	.0060*
5339		Gearbox deaerator				
		impeller shaft spline - - - - -	.0604	.0619		
		Gearbox spur gear spline - - - - -	.0654	.0664	.0035*	.0060*
5340		1. Gearbox drive spur bevel gearshaft internal spline				
		a) Effective space width - - - - -	.0785			
		b) Actual space width - - - - -		.0800		
		2. Gearbox drive spur bevel gearshaft external spline				
		a) Effective space width - - - - -		.0740		
		b) actual tooth thickness - - - - -	.0707			
		3. Fit - - - - -			.0045*	
5341		Scavenge pump spur gearshaft - -	.6005	.6015		
		Scavenge pump spur gear - - - - -	.5990	.6000	.0005T*	.0025T*

Table 1. Gearbox Module - Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimension for Ref		Limits	
			Min.	Max.	Min	Max
5342		Scavenge pump spur gearshaft - - - - -	.7770	.7775		
		Scavenge pump spur gear - - - - -	.7750	.7765	.0005T*	.0025T*
5343		Scavenge pump spur gearshaft spline - - - - -	.0623	.0638		
		Scavenge pump spur gear spline - - - - -	.0653	.0668	.0015*	.0045*
5344		Scavenge pump spur gearshaft - - - - -	.7770	.7775		
		Scavenge pump housing - - - - -	.7786	.7797	.0011*	.0027*
5345		Idler spur gear - - - - -	.6605	.6610		
		Housing - - - - -	.6621	.6634	.0011*	.0029*
5346	B	Scavenge pump housing - - - - -	3.2570	3.2585		
		Gearbox rear housing - - - - -	3.2605	3.2635	.0020*	.0065*
5347	B	Scavenge pump housing - - - - -	3.2570	3.2585		
		Gearbox rear housing - - - - -	3.2605	3.2635	.0020*	.0065*
5348		Scavenge pump housing - - - - -	.6621	.6634		
		Idler spur gear - - - - -	.6605	.6610	.0011*	.0029*
5349		Scavenge pump housing - - - - -	.6871	.6884		
		Scavenge pump spur gearshaft - - - - -	.6855	.6860	.0011*	.0029*
5350		Main pump spur gear - - - - -	.6855	.6860		
		Housing - - - - -	.6871	.6884	.0011*	.0029*
5351		Main pump drive spur gearshaft - - - - -	.6855	.6860		
		Spur gear - - - - -	.6870	.6880	.0010*	.0025*

Table 1. Gearbox Module - Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimension for Ref		Limits	
			Min.	Max.	Min	Max
5352		Main pump drive spur				
		gearshaft - - - - -	.6605	.6610		
		Main pump housing - - - - -	.6621	.6634	.0011*	.0029*
5353		Main pump drive spur				
		gearshaft - - - - -	.6605	.6610		
		Drive spur gear - - - - -	.6620	.6630	.0010*	.0025*
5354		Drive spur gear - - - - -	.6605	.6610		
		Seven spur gear - - - - -	.6615	.6625	.0005*	.0020*
5355		Main pump drive spur				
		gearshaft - - - - -	.6855	.6860		
		Main pump housing - - - - -	.6871	.6884	.0011*	.0029*
5356		Spring seat - - - - -	.7015	.7020		
		Bypass valve housing - - - - -	.7035	.7045	.0015*	.0030*
5357		Main pump housing - - - - -	3.2570	3.2585		
		Housing - - - - -	3.2605	3.2635	.0020*	.0065*
5358		Main pump housing spacer - - - - -	3.2570	3.2585		
		Main pump housing - - - - -	3.2605	3.2635	.0020*	.0065*
5359		Drive spur gear - - - - -	.775	.776		
		Main pump housing spacer - - - - -	.778	.779	.002*	.004*
5360		Drive spur gear spline - - - - -	.0490	.0505		
		Spur gearshaft spline - - - - -	.0465	.0475	.0015*	.0040*
5361		Main pump housing - - - - -	3.669	3.672		
		Gearbox rear housing - - - - -	3.672	3.673	.000*	.004*
5362		Bypass valve - - - - -	.877	.878		
		Main pump housing - - - - -	.879	.880	.001*	.003*
5363		Bypass valve housing - - - - -	.877	.878		
		Main pump housing - - - - -	.879	.880	.001*	.003*

Table 1. Gearbox Module - Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimension for Ref		Limits	
			Min.	Max.	Min	Max
5364		Bypass valve cover - - - - -	.4785	.4805		
		Main pump housing - - - - -	.4810	.4830	.0005*	.0045*
5365		Bypass valve cover - - - - -	.4155	.4175		
		Main pump housing - - - - -	.4180	.4200	.0005*	.0045*
5368		End Clearance				
		Pump gear - - - - -	2.179	2.180		
		Scavenge pump housing - - - - -	2.1825	2.1840	.0025*	.0050*
5369	B	Gearbox mount bushing - - - - -	.6190	.6195		
		Gearbox sleeve - - - - -	.6190	.6200	.001*	.0005T*
5371		Gear spur drive spline - - - - -	.0460	.0475		
		Gear spline - - - - -	.0490	.0505	.0015*	.0045*
5372		Main pump drive spur				
		gearshaft - - - - -	1.497	1.498		
		Main pump housing - - - - -	1.504	1.506	.006*	.009*
5373		Drive spur gear - - - - -	1.497	1.498		
		Pump housing - - - - -	1.504	1.506	.006*	.009*
5374	B	Gearbox bearing nozzle - - - - -	.5210	.5215		
		Gearbox rear housing - - - - -	.5210	.5220	.0010L*	.0005T*
5376		End Clearance				
		Scavenge pump spur				
		gearshaft - - - - -	2.1790	2.1800		
5377		Scavenge pump housing - - - - -	2.1825	2.1840	.0025*	.0050*
		Scavenge pump spur				
5377		gearshaft - - - - -	1.497	1.498		
		Scavenge pump housing - - - - -	1.504	1.506	.006*	.009*

Table 1. Gearbox Module - Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimension for Ref		Limits	
			Min.	Max.	Min	Max
5379		Main pump drive spur gearshaft - - - - -	.6605	.6610		
		Seven spur gear - - - - -	.6615	.6625	.0005*	.0020*
5380		Drive spur gear - - - - -	.6605	.6610		
		Drive spur gear - - - - -	.6620	.6630	.0010*	.0025*
5381		Dowel pin - - - - -	.24975	.25025		
		Gearbox hsg - - - - -	.25100	.25200	.00075*	.00225*
5382		End Clearance				
		Pump gear - - - - -	2.0380	2.0390		
		Total sum of pump housing 5382-1, 5382-2 and spacer 5382-3 - - - - -	2.0415	2.0445	.0025*	.0065*
5385		Gearbox bearing nozzle - - - - -	.5705	.5725		
		Gearbox rear housing - - - - -	.5815	.5825	.009*	.012*
5386		Main fuel pump drive gear - - - -	1.7325	1.7330		
		Ball bearing - - - - -	1.7321	1.7323	.0002T*	.0009T*
5387		Ball bearing - - - - -	2.9575	2.9578		
		Bearing retaining plate - - - - -	2.9568	2.9578	.0003T*	.001T*
5388		Main fuel pump drive gear - - - -	1.7325	1.7330		
		Bearing retainer seal shaft - - -	1.7310	1.7320	.0005T*	.002T*
5389		Face seal - - - - -	3.2530	3.2550		
		Gearbox oil seal retainer - - - -	3.2485	3.2495	.0035T*	.0065T*
5390		Inner bearing spacer - - - - -	1.753	1.754		
		Main fuel pump drive gear - - - -	1.752	1.753	.000*	.002*
5391		Bearing retaining plate - - - - -	2.9518	2.9528		
		Outer bearing spacer - - - - -	2.9488	2.9508	.001*	.004*
5392		Bearing retaining plate - - - - -	2.9568	2.9578		
		Outer bearing spacer - - - - -	2.9488	2.9508	.006*	.009*
5393		Reduction gearbox housing - - - -	3.3903	3.3913		
		Bearing retaining plate - - - - -	3.3938	3.3941	.0025T*	.0038T*

Table 1. Gearbox Module - Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimension for Ref		Limits	
			Min.	Max.	Min	Max
5394		Reduction gearbox housing - - - -	3.3203	3.3213		
		Bearing retaining plate - - - - -	3.3238	3.3241	.0025T*	.0038T*
5395		Reduction gearbox housing - - - -	6.497	6.499		
		Main gearbox housing - - - - -	6.499	6.500	.000*	.003T*
5396		Main gearbox housing - - - - -	4.762	4.776		
		Reduction gearbox housing - - - -	4.752	4.754	.008	.024
5397		Roller bearing - - - - -	2.9525	2.9528		
		Bearing retaining plate - - - - -	2.9518	2.9528	.0003*	.001T*
5398		Reduction gearbox housing - - - -	3.598	3.601		
		Gearbox oil seal retainer - - - -	3.595	3.597	.001*	.006*
5399		Roller bearing - - - - -	1.7715	1.7717		
		Main fuel pump drive gear - - - -	1.7719	1.7724	.0002T*	.0009T*
5401		Main gearbox driveshaft				
		coupling spline - - - - -	.0696	.0731		
		Gearshaft - - - - -	.0759	.0794	.0028*	.0098*
5402		Remote gearbox driveshaft				
		coupling - - - - -	1.3720	1.3725		
		Gearshaft - - - - -	1.3728	1.3737	.0003*	.0017*
5403		Reduction gearbox housing - - - -	.541	.545		
		Gearbox bearing oil				
		nozzle - - - - -	.537	.539	.002*	.008*
5404		Breather pressurizing				
		valve housing - - - - -	2.4354	2.4364		
		Gearbox housing - - - - -	2.4369	2.4379	.0005*	.0025*
5405		Breather pressurizing				
		valve retaining ring - - - - -	2.201	2.226		
		Housing - - - - -	2.180	2.192	.009T*	.046T*
5406		Oil seal retainer - - - - -	2.043	2.044		
		Breather pressurizing				
		valve housing - - - - -	2.044	2.045	.000*	.002*

Table 1. Gearbox Module - Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimension for Ref		Limits	
			Min.	Max.	Min	Max
5407		Face Seal - - - - -	1.626	1.628		
		Oil seal retainer - - - - -	1.623	1.624	.002T*	.005T*
5408		Headless straight pin - - - - -	.12475	.12525		
		Breather pressurizing valve - - - - -	.12600	.12700	.00075*	.00225*
5409		Breather pressurizing valve - - - - -	.233	.237		
		Bellows - - - - -	.247	.253	.010*	.020*
5410		Breather pressurizing valve bellows - - - - -	.309	.312		
		Cover - - - - -	.313	.314	.001*	.005*
5411		Breather pressurizing valve guide - - - - -	2.365	2.375		
		Housing - - - - -	2.377	2.385	.002*	.020*
5412		Breather pressurizing valve cover - - - - -	2.266	2.274		
		Guide - - - - -	2.284	2.315	.010*	.049*
5413		Side Clearance - - - - -				
		Breather pressurizing valve housing - - - - -	.086	.091		
5414		Retaining ring - - - - -	.075	.081	.005*	.016*
		Breather pressurizing valve housing - - - - -	2.508	2.510		
5415		Gearbox housing - - - - -	2.514	2.518	.004*	.010*
		Gearbox mount sleeve - - - - -	.678	.679		
5416		Gearbox housing - - - - -	.6765	.6775	.0005T*	.0025T*
		Gearbox mount sleeve - - - - -	.708	.709		
5417		Gearbox housing - - - - -	.7065	.7075	.0005T*	.0025T*
		Gearbox mount bushing - - - - -	.6490	.6495		
5417		Gearbox sleeve - - - - -	.649	.650	.001*	.0005T*



**Table 2. Gearbox Module - Torque Limits**  
(See FO-1.)

Ref No.	Name	Limits	
		Min	Max
5801	Fuel pump drive gearshaft		
	Rear bearing nut - - - - -	425	475
5802	Fuel pump drive gearshaft		
	Front bearing nut - - - - -	425	475
5803	Alternator drive shaft		
	Rear bearing nut - - - - -	475	525
5804	Alternator drive shaft front bearing nut		
	Torque 950 to 1050 lb-in. - - - - -		
	Loosen nut to zero torque; then torque 475 to 525 lb-in. - - - - -		
5805	Towershaft drive gearshaft		
	Lower bearing nut - - - - -	250	270
5806	Towershaft drive gearshaft		
	Upper bearing nut (torque to max.) - - - - -	550	650
5807	Gearbox sleeve bearing nut		
	Tighten 575 to 625 lb-in. then if necessary, advance to locking position - - - - -		
5008	Idler gearshaft bearing nut		
	Tighten 80 to 90 lb-in. then, if necessary, advance to locking position - - - - -		
5809	Main oil pump drive gearshaft retaining nut - - - - -	510	560

Table 2. Gearbox Module - Torque Limits (See FO-1.) (continued)

Ref No.	Name	Limits	
		Min	Max
5810	Oil filter element housing nut. Tighten filter bowl to achieve 0.000 to 0.030 inch clearance with mating shoulder of filter head assembly. Do not exceed 300 lb-in. torque to achieve this clearance		
5811	Metal chip detector - - - - -	115	130
5812	Nozzle - - - - -	115	130
5813	Bolt - - - - -	420	445
5814	Idler gearbox bolt Tighten 70 to 85 lb-in. verify idler shaft is seated properly all around. Repeat procedure as necessary until required bolt torque on all three(3) bolt and proper idler shaft seating is achieved simultaneously. - - - - -		
5815	Main oil pump spur gear apply a 2.0 lb-in. maximum torque to this spur gear prior to assembly in gearbox.		
5816	Main fuel pump drive gear ball bearing retaining nut - - - - -	525	575
5817	Main fuel pump drive gear retaining nut - -	425	475
5818	Breather pressurizing valve retaining nut -	65	85

**Table 3. Gearbox Module - Spring Loads**  
(See FO-1.)

Ref No.	Name	Limits	
		Min	Max
5950	Scavenge pump bypass valve spring		
	At .870 inch - - - - -	4.625	5.125
	At 1.160 inches - - - - -	1.125	1.375
5951	Main pump bypass valve spring		
	At 1.292 inches - - - - -	19.250	20.750
	At .992 inch - - - - -	48.500	51.500
5952	Helical compression spring		
	At 1.235 inches - - - - -	3.125	3.375
	At .965 inch - - - - -	4.062	4.562
5953	Breather pressurizing valve bellows		
	1. External force at 6.0 lb with external pressure of 6.8 to 7.5 psia at 2.050 inch length		
	2. External force to be greater than 8.2 lb with external pressure of 11.0 psia at 1.728 inch length		

Table 4. Gearbox Module - Spring Loads (See FO-1.)

Ref No.	DIR	Name	Dimensions for Ref		Limits	
			Min	Max	Min	Max
5701		Backlash:				
		Pump Drive Spur Gear - - - - -	.0045	.0075		
		Idler gear - - - - -	.0045	.0075	.0045*	.0195*
5703		Backlash:				
		Gearbox drive gearshaft assembly of - - - - -	.027	.029		
		Gearbox bevel gear - - - - -	.027	.029	.027*	.085*
5704		Backlash:				
		Gearbox drive gearshaft assembly of - - - - -	.007	.011		
		Gearbox spur gearshaft - - - - -	.007	.011	.007*	.029*
5705		Backlash:				
		Gearbox spur gear - - - - -	.007	.011		
		Gear - - - - -	.008	.012	.0075*	.0305*
5706		Backlash:				
		Gearbox spur gear - - - - -	.008	.012		
		Gear - - - - -	.008	.012	.008*	.032*
5707		Backlash:				
		Gearbox spur gearshaft - - - - -	.007	.011		
		Main pump spur gear - - - - -	.007	.011	.007*	.029*
5708		Backlash:				
		Internal spur gear - - - - -	.006	.010		
		External spur gear - - - - -	.006	.010	.012*	.028*



